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ANNOUNCING

ANNUAL REVIEW OF NUCLEAR SCIENCE

Volume one of the Annual Review of Nuclear Science, which consists of twenty-six chapters written by leading authorities in the fields of nuclear physics, chemistry and biomedicine, will be off the press in April, 1952.

This is the first in a series of yearly review volumes in which critical reviews of current interest and importance in the field of nuclear science will appear.

The series is sponsored by the Committee on Nuclear Science of the National Research Council and will be published by Annual Reviews, Inc., Stanford, Calif., who publish seven other Annual Reviews including the Annual Review of Biochemistry which commenced in 1931.

Volume one of the Annual Review of Nuclear Science was prepared under the editorial supervision of Dr. Alberto F. Thompson and Dr. Donald F. Mastick of the Atomic Energy Commission's Technical Information Service and Dr. Dwight E. Gray of the Navy Research Section, Library of Congress.

Future volumes will appear under the direction of Dr. James G. Beckerley (Atomic Energy Commission) as Editor and Dr. Donald F. Mastick (Atomic Energy Commission), Professor Martin D. Kamen (Washington University), and Professor Leonard I. Schiff (Stanford University) as Associate Editors, and an Editorial Committee consisting initially of Professor C. D. Coryell (Massachusetts Institute of Technology), Dr. L. F. Curtiss (National Bureau of Standards), Professor L. I. Schiff (Stanford University), Professor E. Segrè (University of Illinois), and Professor R. E. Zirkle (University of Chicago).

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U. S. ATOMIC ENERGY COMMISSION DECLASSIFIED REPORTS

AECD-3315 1988
[Ames Lab.]
THE PRODUCTION OF BERYLLIUM BY THE METALLOTHERMIC REDUCTION OF BERYLLIUM FLUORIDE, by F. H. Spedding, H. A. Wilhelm, W. H. Keller, and Charles Neher. Sept. 30, 1945. Decl. with deletions Feb. 20, 1952. 13p. (AECD-3315)

AECD-3316 2011
A HIGH PRECISION METHOD FOR THE VOLUMETRIC DETERMINATION OF URANIUM, by M. S. Richmond and C. J. Rodden. [nd] Decl. with deletions Sept. 23, 1948. 15p. (AECD-3316; CJR-RM-639)

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Battelle Memorial Inst.
GALLIUM IN NUCLEAR REACTORS; CONSIDERATIONS FOR USE AS A PRIMARY COOLANT, by R. I. Jaffee, R. M. Evans, E. A. Fromm, and B. W. Gonser. Aug. 1, 1949. Decl. with deletions Feb. 27, 1952. 44p. (AECD-3317; BMI-T-17)

AECD-3318 2060
Carbide and Carbon Chemical Co. (K-25)
CRITICAL TEMPERATURE AND PRESSURE OF URANIUM HEXAFLUORIDE, by G. D. Oliver, J. W. Grisard, and H. T. Milton. [nd] Decl. Feb. 26, 1952. 2p. (AECD-3318)

AECD-3319 2052
Los Alamos Scientific Lab.
MICRO SYNTHESES WITH TRACER ELEMENTS. XXXI. THE SYNTHESIS OF ETHYLENEDIAMINE TETRA-(2-C_4^{14}-Acetic) ACID, by Arthur Murray III and Anthony R. Ronzio. [nd] Decl. Feb. 25, 1952. 7p. (AECD-3319;LADC-1107)

AECD-3320 2080
Massachusetts Inst. of Tech.
INDUCTIVE MELTING OF REACTIVE METALS WITHOUT REFRACTORY CONTAINERS, by T. T. Magel, P. A. Kulin. and A. R. Kaufmann. Jan. 1952. Decl. with deletions Feb. 11, 1952. 13p. (AECD-3320; MIT-1080)

AECD-3321 2081
Massachusetts Inst. of Tech.
VACUUM REDUCTION OF SOME METALLIC OXIDES USING ZIRCONIUM, by T. T. Magel. Jan. 1952. Decl. with deletions Feb. 11, 1952. 15p. (AECD-3321; MIT-1081)

AECD-3322 2064*
Brookhaven National Lab.
TENTATIVE SPECIFICATION FOR WASTE HEAT STEAM BOILER, by C. Williams. Aug. 1, 1949. Decl. Jan. 4, 1950. 8p. (AECD-3322)

AECD-3323 2082
Battelle Memorial Inst.
THE VANADIUM-URANIUM CONSTITUTIONAL DIAGRAM, by H. A. Saller and F. A. Rough. Dec. 15, 1951. Decl. with deletions Mar. 5, 1952. 17p. (AECD-3323; BMI-716)

U. S. ATOMIC ENERGY COMMISSION UNCLASSIFIED REPORTS

AECU-1294(Rev.) 2061
Los Alamos Scientific Lab.
THE HEATS OF COMBUSTION OF THROIUM AND URANIUM, by Elmer J. Huber, Jr., Charles E. Holley, Jr., and E. H. Meierkord. [nd] 12p. (AECU-1294(Rev.); LADC-960(Rev.))

AECU-1587 2102
St. Louis Univ.
NEUTRON DIFFRACTION STUDY OF THE STRUCTURE OF VITREOUS SiO_2 (FUSED QUARTZ) AND BORON-FREE SODA-LIME-SILICA GLASS, by A. H. Weber. St. Louis Univ. and Argonne National Lab. May 15, 1951. 48p. (AECU-1587)

AECU-1869 1990
Massachusetts Inst. of Tech.
THE ACTIVITY OF SULFUR IN LIQUID IRON AND STEEL, by Charles W. Sherman and John Chipman. [nd] 31p. (AECU-1869)

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Oak Ridge National Lab.
RECOVERY OF X-IRRADIATED BACTERIA AT SUBOPTIMAL INCUBATION TEMPERATURES (abstract), by G. E. Stapleton, Daniel Billen, and Alexander Hollaender. [nd] 1p. (AECU-1873)

AECU-1874 1989
Oak Ridge National Lab.
THE APPLICATION OF ION-EXCHANGE CHROMATOGRAPHY TO NUCLEOTIDES, AMINO ACIDS, SUGARS, AND RELATED SUBSTANCES (abstract), by Waldo E. Cohn. [nd] 1p. (AECU-1874)

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Oak Ridge National Lab.
THERMODYNAMIC STUDIES OF SOME ENZYME-INHIBITOR COMPLEXES (abstract), by Fred Vaslow and David G. Doherty. [nd] 1p. (AECU-1875)

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Oak Ridge National Lab.
1. GAMETE FACTOR ON CHROMOSOME 9. 2. THE EFFECT OF OXYGEN TENSION ON THE RADIOSENSITIVITY OF CHROMOSOMES (abstract), by Drew Schwartz. [nd] 1p. (AECU-1876)

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AECU-1879 2214
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PROGRESS REPORT, by J. Marx, J. Koehler, C. Wert, and A. Overhauser. Feb. 1, 1952. 7p. (AECU-1879)

AECU-1880 2053
Los Alamos Scientific Lab.
MICRO SYNTHESES WITH TRACER ELEMENTS. XXIX. THE SYNTHESIS OF 1,2-DIHYDROXYANTHRAQUINONE-9-C^{14}, by D. Lloyd Williams and Anthony R. Ronzio. [nd] 25p. (AECU-1880; LADC-1082)

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EXPLANATION OF CERTAIN DESIGN CRITERIA; CHEMISTRY-METALLURGY RESEARCH BLDG., LOS ALAMOS, NEW MEXICO, by J. B. Graham. [nd] 8p. (AECU-1881; LADC-1106)

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MICRO SYNTHESES WITH TRACER ELEMENTS. XXX. THE SYNTHESIS OF PENTAMETHYLENETETRAZOLE (METRAZOLE) LABELED WITH C^{14}, by Arthur Murray III and Anthony R. Ronzio. [nd] 4p. (AECU-1882; LADC-1087)

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FAST NEUTRON COUNTING WITH HYDROGENOUS LIQUID PHOSPHORS, by G. R. Keepin and R. H. Lovberg. Los Alamos Scientific Lab. and Univ. of Minnesota. [nd] 6p. (AECU-1884; LADC-1054)

AECU-1885 1971
Los Alamos Scientific Lab.
X-RAY AND ELECTRON RADIOGRAPHY OF THIN SPECIMENS, by Arthur I. Berman and James W. Dutli. Oct. 1, 1951. 26p. (AECU-1885; LADC-1064)

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Institute of Engineering Research, Univ. of Calif.
HEAT TRANSFER TO MOLTEN LEAD-BISMUTH EUTECTIC IN TURBULENT PIPE FLOW; 1 JULY 1951 TO 1 FEBRUARY 1952 (Interim Report), by H. A. Johnson, J. P. Hartnett, and W. J. Clabaugh. Feb. 1, 1952. 14p. (AECU-1888)

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RANGE OF PROTONS IN HYDROGEN AND OXYGEN, by Charles J. Cook, Emerson Jones and Theodore Jorgensen. [nd] 14p. (AECU-1890)

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Oak Ridge National Lab.
MECHANISM OF LETHAL AND MUTAGENIC ACTION OF IONIZING RADIATIONS ON *ASPERGILLUS TERREUS*. II. USE OF MODIFYING AGENTS AND CONDITIONS, by G. E. Stapleton and Alexander Hollaender. [nd] 20p. (AECU-1892)

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Brookhaven National Lab.
RELATIONSHIPS BETWEEN IONIZING RADIATION, CHROMOSOME BREAKAGE AND CERTAIN OTHER NUCLEAR DISTURBANCES, by A. H. Sparrow, M. J. Moses and Rosalind DuBow. [nd] 39p. (BNL-1066)

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Brookhaven National Lab.
ORGANIZATION AND FUNCTION OF THE INORGANIC CONSTITUENTS OF NUCLEI, by D. F. Poulson and V. T. Bowen. Yale Univ. and Brookhaven National Lab. [nd] 37p. (BNL-1074)

ISC-152 2012
Ames Lab.
DETERMINATION OF TRACE QUANTITIES OF IRON IN ZIRCONIUM AND ITS COMPOUNDS, by Augustus Sidney Ayers and Charles V. Banks. Aug. 1950. 68p. (ISC-152)

ISC-180(Rev.) 2181
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RADIOACTIVITIES OF PLATINUM AND IRIDIUM FROM PHOTONUCLEAR REACTIONS IN PLATINUM, by Darleane Christian, Russell F. Mitchell, and Don S. Martin, Jr. (ISC-180(Rev.))

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Ames Lab.
NEW TECHNIQUE FOR THE DETERMINATION OF PHOTONUCLEAR CROSS SECTIONS, by Lester L. Newkirk. Feb. 18, 1952. 9p. (ISC-201)

KAPL-663 2084
Knolls Atomic Power Lab.
PRECISION EQUIPMENT FOR METALLURGICAL ANALYSES, by L. L. Wyman. Issued June 1950. Re-issued Jan. 1952. 153p. (KAPL-663)

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LA-1337 2178
Los Alamos Scientific Lab.
GAS RECOMBINATION SYSTEM OF THE LOS ALAMOS HOMOGENEOUS REACTOR, by M. E. Bunker, R. P. Hammond, L. D. P. King, J. A. Leary and W. R. Wykoff. Issued Mar. 6, 1952. 27p. (LA-1337)

NYO-880 2073
Massachusetts Inst. of Tech.
THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS; Progress Report. Jan. 31, 1952. 51p. (NYO-880; MITS-14)

NYO-3003 2140
Palmer Physical Lab., Princeton Univ.
THEORY AND USE OF PULSE IONIZATION CHAMBERS, WITH EMPHASIS ON RECENT APPLICATIONS, by W. Franzen. Dec. 1, 1951. 97p. (NYO-3003)

NYO-3046 2161
Rochester Univ.
PROCEEDINGS OF THE ROCHESTER CONFERENCE ON MESON PHYSICS; JANUARY 11-12, 1952, by A. M. L. Messiah and H. P. Noyes. [nd] 107p. (NYO-3046)

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QUARTERLY PROGRESS REPORT; THERMODYNAMIC PROPERTIES OF SODIUM VAPOR, by W. A. Selke, Herman Krinsky, and Carl Muendel. Oct. 1, 1951. (NYO-3096)

NYO-3180 2022
Carnegie Inst. of Tech.
ON THE ROLE OF GRAIN BOUNDARIES IN CREEP, by M. R. Achter and R. Smoluchowski. Jan 10, 1952. 6p. (NYO-3180)

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Yale Univ.
EFFECT OF GAMMA RADIATION ON CHEMICAL REACTIONS. I. INSTALLATION OF COBALT-60 RADIATION SOURCE; PROGRESS REPORT NO. 1 (FOURTH QUARTER, 1951). Randolph H. Bretton, Director. Jan. 20, 1952. 10p. (NYO-3307; Progress Report No. 1)

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STUDIES ON COORDINATION COMPOUNDS. IV. A COMPARISON OF THE CHELATING TENDENCIES OF BETA-DIKETONES WITH DIVALENT METALS, by LeGrand G. Van Uitert, W. Conard Fernelius, and Bodie E. Douglas. Jan. 16, 1952. 15p. (NYO-3369)

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THE THERMAL CONDUCTIVITY OF MOLYBDENUM OVER THE TEMPERATURE RANGE 1000-2100°F, by Edward P. Mikol. Oak Ridge National Lab. and Alabama Univ., Engineering Experiment Station. Issued Feb. 28, 1952. 11p. (ORNL-1131)

ORNL-1206 1997
Oak Ridge National Lab.
STUDIES ON THE ANALYSIS FOR AND THE PREPARATION OF FLAVONOID COMPOUNDS (thesis), by Carl D. Douglass. Oak Ridge National Lab. and Oklahoma Univ. [nd] 106p. (ORNL-1206)

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Oak Ridge National Lab.
FERMI FUNCTIONS FOR ALLOWED BETA TRANSITIONS, by N. Dismuke, M. E. Rose, C. L. Perry and P. R. Bell. Issued Mar. 7, 1952. 26p. (ORNL-1222)

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Sylvania Electric Products Inc.
DIMENSIONAL CHANGES NORMAL TO THE DIRECTION OF DIFFUSION, by R. W. Balluffi and B. H. Alexander. Issued Feb. 18, 1952. 21p. (SEP-86)

SO-1007 2010
Illinois Univ., Engineering Experiment Station
THERMAL FORCE ON AN AEROSOL PARTICLE IN A TEMPERATURE GRADIENT, by R. L. Saxton and W. E. Ranz. Dec. 31, 1951. 44p. (SO-1007; Technical Report No. 6)

TAB-78 2065*
Oak Ridge National Lab., Y-12 Area
THERMODYNAMIC PROPERTIES OF STEAM AT VERY HIGH PRESSURE; EXTRAPOLATION OF PUBLISHED DATA, by David H. Fax. Aug. 2, 1950. 13p. (TAB-78)

TID-3010 2089
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ZIRCONIUM; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE, Hugh E. Voress and Fred E. Croxton, comps. Mar. 1952. (TID-3010)

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Technical Information Service, AEC
SCINTILLATION DETECTORS: A SELECTED LIST OF UNCLASSIFIED REPORTS, by Robert L. Morgan. Feb. 25, 1952. 11p. (TID-3023)

UCLA-184 2048
Atomic Energy Project, Univ. of Calif., Los Angeles
PREPARATION AND PROPERTIES OF THYMUS NUCLEIC ACID, by Norman S. Simmons, Stella A. Chavos, and H. Kenneth Orbach. Feb. 14, 1952. 24p. (UCLA-184)

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UCRL-1609 2057
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THE PATH OF CARBON IN PHOTOSYNTHESIS, IV. RIBULOSE AND SEDOHEPTULOSE, by A. A. Benson, J. A. Bassham, M. Calvin, A. G. Hall, H. Hirsch, S. Kawaguchi, V. Lynch, and N. E. Tolbert. Jan. 1952. 25p. (UCRL-1609)

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Radiation Lab., Univ. of Calif.
TRANSFER OF ANODE METAL IN D-C NON-SPARKING

DISCHARGES IN HIGH-VACUUM, by Harry G. Heard and Eugene J. Lauer. Jan. 22, 1952. 18p. (UCRL-1622)

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SUMMARY OF RESEARCH PROGRESS MEETING OF DECEMBER 6, 1951, by S. Shewchuck. Feb. 5, 1952. 7p. (UCRL-1649)

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Y-756 2121
Oak Ridge National Lab. (Y-12 Area)
A CONTINUOUS SOLUTION OF THE PLASMA-SHEATH EQUATION OF AN ARC, by Raymond Murray and O. G. Harrold, Jr. May 1, 1951. 35p. (Y-756)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE-C/R-768 2047
Atomic Energy Research Establishment, Harwell, Berks (England)
THE EXTRACTION OF THE URANYL ION BY THIOPHENOYL TRIFLUOROACETONE, by G. N. Walton, F. Barker, and G. Byfleet. Aug. 20, 1951. 31p. (AERE-C/R-768)

ERDE-4/EMR/51 1991
Explosives Research and Development Establishment, Waltham Abbey, Essex (England)
THE DETERMINATION OF THE IONIC PRODUCT OF MIXTURES OF HYDROGEN PEROXIDE AND WATER (Interim Report), by A. G. Mitchell. July 1951. 16p. (ERDE-4/EMR/51)

NACA-TN-2573 2197
Ohio State Univ.
DEVELOPMENT OF AUXILIARY CYCLOTRON EQUIPMENT FOR USING TRITIUM AS BOMBARDING PARTICLES IN A CYCLOTRON, by D. N. Kundu, F. G. Boyle and M. L. Pool. Dec. 1951. 19p. (NACA-TN-2573)

NACA-TN-2602 2085
Notre Dame Univ.
SURVEY OF THE CHROMIUM-COBALT-NICKEL PHASE DIAGRAM AT 1200°C, by W. D. Manly and Paul A. Beck. Feb. 1952. 45p. (NACA-TN-2602)

NACA-TN-2603 2086
Notre Dame Univ.
SURVEY OF PORTIONS OF THE COBALT-CHROMIUM-IRON-NICKEL QUATERNARY SYSTEM, by E. L. Kamen and Paul A. Beck. Feb. 1952. 62p. (NACA-TN-2603)

NACA-TN-2618 2021
Battelle Memorial Inst.
CREEP IN METALS, by A. D. Schwope, F. R. Shober, and L. R. Jackson. Feb. 1952. 52p. (NACA-TN-2618)

NACA-TN-2629 2067
Lewis Flight Propulsion Lab., NACA
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF FULLY DEVELOPED TURBULENT FLOW OF AIR IN A SMOOTH TUBE WITH HEAT TRANSFER WITH VARIABLE FLUID PROPERTIES, by R. G. Deissler and C. S. Eian. Feb. 1952. 43p. (NACA-TN-2629)

NACA-TN-2635 2068
Lewis Flight Propulsion Lab., NACA
AN ANALYSIS OF LAMINAR FREE-CONVECTION FLOW AND HEAT TRANSFER ABOUT A FLAT PLATE PARALLEL TO THE DIRECTION OF THE GENERATING BODY FORCE, by Simon Ostrach. Feb. 1952. 47p. (NACA-TN-2635)

NACA-TN-2639 2087
Battelle Memorial Inst.
FATIGUE STRENGTHS OF AIRCRAFT MATERIALS; AXIAL-LOAD FATIGUE TESTS ON NOTCHED SHEET SPECIMENS OF 24S-T3 AND 75S-T6 ALUMINUM ALLOYS AND OF SAE 4130 STEEL WITH STRESS-CONCENTRATION FACTOR OF 1.5, by H. J. Grover, W. S. Hyler, and L. R. Jackson. Feb. 1952. 22p. (NACA-TN-2639)

NBS-1164 2026
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF CARBON MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Oct. 1, 1951. 7p. (NBS-1164; U20677)

NBS-1196 2027
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF CHLORINE MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Dec. 1, 1951. 7p. (NBS-1196; U20679)

NBS-1294 2028
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTHALPY, FREE ENERGY AND ENTROPY OF MONATOMIC FLUORINE IN THE IDEAL GASEOUS STATE, by Rita M. Potocki and Charles W. Beckett. Dec. 1, 1951. 6p. (NBS-1294; U20678)

NP-3163 2074
Massachusetts Inst. of Tech.
SOLUBILITY RELATIONSHIPS IN SOME OF THE TERNARY SYSTEMS OF REFRACTORY MONOCARBIDES, by John T. Norton and A. L. Mowry. April 20, 1951. 12p. (NP-3163; Technical Report No. 3)

NP-3583 2104
Georgia Inst. of Tech.
STUDIES OF COMPOUNDS FOR SUPERCONDUCTIVITY, by W. T. Ziegler and R. A. Young. Nov. 28, 1951. 37p. (NP-3583; Technical Report No. 3)

NP-3594 2166
Massachusetts Inst. of Tech.
QUARTERLY PROGRESS REPORT NO. 3. Jan. 15, 1952. 31p. (NP-3594; Quarterly Progress Report No. 3; U2066)

NP-3596 2117
Indiana Univ.
THE CRYSTAL STRUCTURE OF DIMETHYLGLYOXIME, by Lynne L. Merritt, Jr. and Elma Lanterman. [nd] 20p. (NP-3596; U-20655)

NP-3600 1950
Naval Medical Research Inst., Bethesda
THE SEQUENCE OF PATHOLOGIC CHANGES IN SWINE EXPOSED TO THE $LD_{100/30}$ OF TOTAL BODY SUPERVOLTAGE X-RADIATION, by John L. Tullis. Aug. 24, 1951. 17p. (NP-3600)

NP-3616 2124
Wisconsin Univ.
THE VIRIAL EQUATION OF STATE, by R. Byron Bird and Ellen L. Spotz. May 10, 1950. 144p. (NP-3616; CM-599; U10999)

NP-3617 2134
New York Univ.
RESEARCH OF FLUORESCENCE AND THE CONDUCTIVITY PHENOMENA: THIRD QUARTERLY REPORT FOR MONTHS INCLUDING AUGUST, SEPTEMBER, OCTOBER, by Hartmut Kallmann. Dec. 1951. 53p. (NP-3617; Progress Report 3; U20806)

NP-3623 1964
Naval Medical Research Inst., Bethesda
PROTHROMBIN UTILIZATION IN FATAL RADIATION INJURY, by D. P. Jackson, E. P. Cronkite, G. J. Jacobs, and C. F. Behrens. June 26, 1951. 17p. (NP-3623; R5997)

NP-3627 1996
Louisiana State Univ.
IMPLICATIONS OF THE KINETICS OF IONIC RECOMBINATION WITH REGARD TO SOME ELECTROCHEMICAL PROCESSES, by Paul Delahay. Sept. 1951. 15p. (NP-3627; Technical Report No. 3; U-20199)

NP-3628 2135
Chemical and Radiological Labs., Army Chemical Center.
CHEMICAL METHODS OF MEASURING RADIATION. Dec. 31, 1951. 3p. (NP-3628)

NP-3629 2136
Chemical and Radiological Labs., Army Chemical Center.
DEVELOPMENT OF RADIATION DOSIMETERS FOR INDIVIDUALS. Dec. 31, 1951. 2p. (NP-3629)

NP-3631 2242
Institute for Nuclear Studies, Univ. of Chicago
TECHNICAL REPORT NO. 1, by Clyde A. Hutchison, Jr. Spring, 1951. 141p. (NP-3631; Technical Report No. 1; U19846)

NP-3635 2126
Research Lab. of Electronics, Mass. Inst. of Tech.
RESPONSE OF NONLINEAR DEVICES TO A PULSED SIGNAL AND GATED NOISE, by D. B. Armstrong. Oct. 4, 1951. 16p. (NP-3635; Technical Report No. 214; U20879)

NP-3650 2137
[Atomic Energy Research Establishment, Harwell, Berks (England)]
WORKING INSTRUCTION MANUAL FOR SCALING UNIT TYPE 200 AND SCALING UNIT TYPE 200A. [nd] 45p. (NP-3650)

NP-3651 2138
[Atomic Energy Research Establishment, Harwell, Berks (England)]
SCALER TYPE 1009A; INTERIM INSTRUCTION MANUAL. Nov. 25, 1948. 6p. (NP-3651)

NP-3652 2139
[Atomic Energy Research Establishment, Harwell, Berks (England)]
RATEMETER TYPE 1011; INSTRUCTION MANUAL. May 28, 1948. 18p. (NP-3652)

NP-3662 2129*
Sloane Physics Lab., Yale Univ.
THERMAL DIFFUSION WITH BORON TRIFLUORIDE, by W. W. Watson, J. O. Buchanan and F. K. Elder, Jr. [nd] Decl. Feb. 25, 1947. 9p. (NP-3662)

NRL-3924 2029
Naval Research Lab.
INFRARED SPECTRA OF FLUORINATED HYDROCARBONS, by D. C. Smith, Morris Alpert, R. A. Saunders, George M. Brown and Norma B. Moran. Feb. 1, 1952. 100p. (NRL-3924)

ONRL-124-51 2127
Office of Naval Research, London (England)
A MAGNETIC SCALING CIRCUIT, by John K. Beling. Dec. 4, 1951. 13p. (ONRL-124-51; U61511)

NUCLEAR SCIENCE ABSTRACTS

Vol. 6 April 15, 1952 No. 7

BIOLOGY AND MEDICINE

1945
Oak Ridge National Lab.
THERMODYNAMIC STUDIES OF SOME ENZYME-INHIBITOR COMPLEXES (abstract), by Fred Vaslow and David G. Doherty. [nd] 1p. (AECU-1875)

In order to determine whether the variation in the thermodynamic functions of the enzyme-substrate complex (Doherty and Vaslow, J. Am. Chem. Soc., 74, 931-6(1952). were actually related to catalytic activity of the enzyme, the properties of several types of enzyme-inhibitor complexes were measured. These systems were (1) chymotrypsin, with the ketone (D-L ketone) obtained by substitution of a methyl group for the carboxyl OH of the substrate, N-acetyl-3:5-dibromo-L-tyrosine (L-acid); (2) L-acid-chymotrypsinogen; and (3) D-acid-chymotrypsin (D-acid derivatives are insensitive to the enzyme but are inhibitors). The apparent free energies of formation of the complexes for all four systems did not change greatly with pH and remained between -2 and -3 thousand calories. The original enzyme-substrate system and (1) above were similar in the behavior of the enthalpy and entropy having negative values of both functions at pH 7.5. Systems (2) and (3) were similar, having positive values of the entropy and small or negligible values of the enthalpy at pH 7.5. These results indicate that the thermodynamic functions of binding may be correlated with catalytic activity. Some attempt is made to interpret these results on the basis of the theoretical calculations of Stearn (J. Gen. Physiol. 18, 301(1935)). (Entire report. Abstract of paper for Milwaukee meeting of Am. Chem. Soc., Mar. 30, 1952.)

1946
Oak Ridge National Lab.
1. GAMETE FACTOR ON CHROMOSOME 9. 2. THE EFFECT OF OXYGEN TENSION ON THE RADIOSENSITIVITY OF CHROMOSOMES (abstract), by Drew Schwartz. [nd] 1p. (AECU-1876)

Gamete factor on chromosome 9. A gamete factor was found which shows close linkage with the waxy gene. In back crosses of heterozygous Ga wx/ga Wx as the male to homozygous waxy plants, only 10% starchy kernels are obtained. Further testing of these B_1 starchy kernels revealed that 30% of them are due to functioning of ga Wx pollen and 70% are crossovers. These data indicate that there is 3% functioning of ga pollen in competition with Ga and 7% crossing over between the Ga and Wx loci. The effect of oxygen tension on the radiosensitivity of chromosomes. Experiments conducted on the irradiations of pollen in different atmospheres revealed that there is a 3.2-fold decrease in chromosome aberrations when the exposures are made in 100% N as compared with exposure in air. The A_1-Sh_2 region was used in this study. A_1 Sh_2 pollen was irradiated and used to pollinate a_1 a_1 sh_2 sh_2 tester plants. Aberrations were detected in the endosperm as entire losses of the dominant characters and as mosaics. Irradiation in nitrogen decreased the frequency of entire losses by a factor of 2.7 while the mosaics were decreased by a factor of 9.9. This difference is statistically significant and strongly suggests that the effect of oxygen tension during irradiation is on the recovery process of broken ends rather than on the initial breakage mechanism as had previously been postulated. (Entire report.)

RADIATION EFFECTS

1947
Oak Ridge National Lab.
RECOVERY OF X-IRRADIATED BACTERIA AT SUBOPTIMAL INCUBATION TEMPERATURES (abstract), by G. E. Stapleton, Daniel Billen, and Alexander Hollaender. [nd] 1p. (AECU-1873)

The influence of suboptimal incubation temperatures on viability of x-irradiated Escherichia coli B/r has been investigated. Washed cells from a 20-hr culture, suspended in phosphate buffer (pH 6.8), were irradiated with 250-kv x rays at 2°C. Aliquots of irradiated suspensions were surface plated on nutrient agar. Duplicate sets of plates were incubated at the various temperatures (6-37°C) for 24 hours, then at 37°C for an additional 24 hours, after which the colonies were counted to determine the survival. As noted by previous investigators, no increase in survival was obtained at 6°C over that obtained at 37°C. However, at all intermediate temperatures (12-30°C) survival was significantly increased, maximal survival being obtained at 18°C for all x-ray doses employed. At a dose of 80,000 r a hundred fold increase in survival resulted at 18°C over that at 37°C. No change in viability of control cells was noted at any of the several temperatures studied. The ratio of survivors at 18°C to that at 37°C is an exponential function of x-ray dose. Recovery is similarly displayed on complete media, whether liquid or solid at the various temperatures, with respect to rate of recovery as well as the final number of recovered cells. Strain differences have been observed both in regard to optimal temperature for recovery as well as to the magnitude of the recovery effect. (Entire report. Abstract of paper for Boston meeting of the Soc. of Am. Bact., Apr. 28, 1952.)

1948
Oak Ridge National Lab.
MECHANISM OF LETHAL AND MUTAGENIC ACTION OF IONIZING RADIATIONS ON ASPERGILLUS TERREUS. II. USE OF MODIFYING AGENTS AND CONDITIONS, by G. E. Stapleton and Alexander Hollaender. [nd] 20p. (AECU-1892)

A direct relationship has been found between x-ray sensitivity of spores of Aspergillus terreus and their relative water content. A reduction of inactivation as well as mutation was obtained also by lowering of oxygen tension in and around spores during x irradiation. It would appear from this investigation that there are two mechanisms of production of mutations by x rays in this material; one affected strikingly by removal of water or oxgyen prior to irradiation, the other seemingly unaffected. The findings of this investigation are consistent with the hypothesis that indirect effects play a major role in inactivation as well as mutation. The importance of reactive decomposition products of water produced intracellularly by x irradiation is indicated. (auth)

1949

Brookhaven National Lab.

RELATIONSHIPS BETWEEN IONIZING RADIATION, CHROMOSOME BREAKAGE AND CERTAIN OTHER NUCLEAR DISTURBANCES, by A. H. Sparrow, M. J. Moses and Rosalind DuBow. [nd] 39p. (BNL-1066)

The relative radiosensitivity of different stages of meiosis of Trillium erectum was determined and is discussed in relation to the amounts of desoxypentose and pentose nucleic acid content of cells at various stages of meiosis. Cytological effects of chronic irradiation of Tradescantia paludosa are described. The relationship of chromosome breakage to mutation and mitotic inhibition and the mechanism of chromosome breakage are discussed. The relationship of radiosensitivity to morphological changes, especially to length of chromonemata, was studied. Data from quantitative cytochemical measurements of normal and irradiated nuclei and considerations and calculations relating to submicroscopic structure and chromosome breakage are included. 60 references.

1950

Naval Medical Research Inst., Bethesda

THE SEQUENCE OF PATHOLOGIC CHANGES IN SWINE EXPOSED TO THE $LD_{100}/_{30}$ OF TOTAL BODY SUPERVOLTAGE X-RADIATION, by John L. Tullis. Aug. 24, 1951. 17p. (NP-3600)

Eighteen 140-lb barrows 5 to 7 months old were subjected to 600 r total-body x radiation administered 300 r to each lateral aspect of the animal at 2-m target-skin distance from the 2000 kvp source. The swine were killed at intervals from 50 min to 164 hr (7 days) after irradiation and their tissues were studied grossly and histologically for morphologic x-ray-induced changes. The sequence of pathologic events in the first 7 days after 600 r total-body irradiation of swine was similar in all of the lymphoid organs. It consisted of destruction of lymphoid cells within 50 min, early removal of debris by phagocytosis, and attempted regeneration beginning after 36 hr. In the bone marrow between 6 and 9 hr after irradiation, there was a progressive diminution of the hematopoietic cells according to a pattern of relative sensitivity; namely, erythroid, myeloid, then megakaryocytoid. No evidence of regeneration within 7 days was observed. Small-bowel epithelium lining the basal mucosal glands underwent necrosis within 3 hr but recovered completely before 29 hr after irradiation.

1951

IRRADIATION EFFECTS ON VIABILITY OF DROSOPHILA MELANOGASTER [abstract]. John W. Gowen and Janice Stadler. Anat. Record 111, 497(1951) Nov.

Physiological effects of various doses of x irradiation on day-old male and female imagoes were studied after repeated pair matings. Twenty-six different criteria for the physiological effects are discussed.

1952

CATARACT FORMATION AND RETINAL DAMAGE FOLLOWING X IRRADIATION OF THE HEADS OF NEWBORN MICE [abstract]. Howard H. Vogel, Jr. Anat. Record 111, 497(1951) Nov.

Data are presented on the percentage of radiation cataracts developed in newborn mice following x-irradiation of the head, and the approximate latent periods before these opacities of the lenses were observed.

1953

SINGLE WHOLE-BODY X IRRADIATIONS OF GUINEA PIGS; PRINCIPAL BIOLOGICAL EFFECTS. Lucien Piguory and Pierre Nizza. Compt. rend. 234, 370-2(1952) Jan. 14. (In French)

In order to establish a base of reference for further studies, the mean biological reactions of male guinea pigs to single whole-body x irradiations of 100, 200, 400, 500, 800, and 1000 r have been studied. About 12,000 examinations were made on 147 guinea pigs. The LD_{50} was 200 r. Average survival was 21.5 days at 200, 13.1 days at 400, and 12.7 days at 500 r. Detailed descriptions are given of the blood pictures from irradiation to recovery or death.

1954

GENETIC DAMAGE BY ROENTGEN RADIATION? H. Chantraine. Röntgen Blätter 5, 1-10(1952) Jan. (In German)

The relative numbers of x-ray and spontaneous mutations in humans are discussed. Direct application to humans of mutation rates observed in Drosophila is shown to be invalid and to lead to absurd conclusions. Genetic changes caused by medical application of x radiation are no more numerous than those caused by numerous other circumstances of modern life.

1955

THE EFFECT OF IONIZING RADIATIONS ON THE BROAD BEAN ROOT. PART X. THE DEPENDENCE OF THE X-RAY SENSITIVITY ON DISSOLVED OXYGEN. John Read. Brit. J. Radiol. 25, 89-99(1952) Feb.

Results of a study of the effect of dissolved O in the surrounding water on the x-ray sensitivity of the broad bean root are reported. Growth curves of groups of bean roots irradiated in water containing 18 cc O per liter, irradiated in water containing 6 cc O per liter, and irradiated anaerobically are presented in tabular form.

1956

ADRENAL ASCORBIC ACID IN MALE AND FEMALE RATS AFTER TOTAL BODY X-RAY IRRADIATION. B. C. Wexler, R. Pencharz, and S. F. Thomas. Proc. Soc. Exptl. Biol. Med. 79, 183-4(1952) Jan.

A brief description is given of experiments in which it was shown that total-body x-irradiation is associated with a marked depletion in adrenal ascorbic acid. The decrease in ascorbic acid is more marked in the male rat than in the female.

1957

EFFECT OF WHOLE-BODY X-RADIATION ON RAT INTESTINAL NUCLEOPROTEIN. Robert N. Feinstein and Carrie L. Butler. Proc. Soc. Exptl. Biol. Med. 79, 181-2 (1952) Jan.

After 800 r of whole-body irradiation to rats, a nucleoprotein-rich fraction of the intestine is diminished in amount and also in its content of total phosphorus, total nitrogen, dry weight, and ash. The greatest loss of phosphorus is derived from the nucleic acid fraction. In addition, the weight of the intestine, as well as the viscosity of its alkaline solutions, is significantly decreased after whole-body irradiation. These data are interpreted as substantiation of the idea that one effect of whole-body irradiation is the degradation of nucleic acid. (auth)

RADIATION HAZARDS AND PROTECTION

1958

EXPOSURE TO X-RADIATION OF LOCALIZED AREAS OF MAMMALIAN SKIN CONDITIONED TO DIFFERENT LEVELS OF METABOLIC ACTIVITY [abstract]. J. P. O'Brien, J. A. Belli, and J. W. Saunders, Jr. Anat. Record 111, 496(1951)No

Preliminary experiments indicate that mammalian skin is less susceptible to the effects of x rays when the over-all metabolic level is reduced. With a given dose of x radiation, over the same post-exposure period, lesions in chilled skin appeared earlier but were less extensive and healed more quickly.

1959

SODIUM PENTOBARBITAL ANESTHESIA AND MORTALITY FROM TOTAL BODY X-RADIATION IN C_{57} (BLACK) MICE.

H. Patterson Mack and Frank H. J. Figge. Anat Record 111, 524(1951) Nov.

The need for inclusion of anesthetized controls in investigations requiring anesthesia of the radiated experimental animal is pointed out. While studying protective mechanisms against radiotoxicity in mice, it was noted that animals which were anesthetized during irradiation appeared to have a lower mortality than unanesthetized animals. Further study led to the conclusion that the mechanism by which nembutal reduced radiosensitivity may be related to a lowering of the metabolic rate and/or hypoxemia during anesthesia.

1960

THE USE OF SMALL PROTECTION FILMS FOR THE ESTIMATION OF THE DOSES RECEIVED ON THE FINGERS AND HANDS DURING RADIUM MANIPULATIONS. T. M. Robb and R. E. Ellis. Brit. J. Radiol. 25, 100-2 (1952) Feb.

A method of measuring the finger and hand doses received during radium operations, both medical and physical, using small standard x-ray film packs, is described. The initial results are also published. (auth)

1961

PROTECTION AGAINST X-RAY AND BETA RADIATION; LEAD GLASS FABRIC. Vincent W. Archer, George Cooper, Jr., and J. G. Kroll. J. Am. Med. Assoc. 148, 106-8(1952) Jan. 12. (cf. NSA 4-1336)

An evaluation is presented of lead-glass fabric as a protection against x and β radiation. The flexibility of the fabric allows it to be folded into as many thicknesses as desired. Its use is suggested in protective clothing and in marking off skin surfaces in superficial x-ray treatment.

1962

A LIPO-PROTEIN-NUCLEIC ACID COMPLEX IN THE TREATMENT OF RADIATION INJURY: (A PRELIMINARY REPORT). Ralph M. Thompson. Military Surgeon 110, 51-9(1952) Jan.

From the conclusions reached in this pilot experiment in the treatment of post-radiation injury, it is believed that nonspecific protein therapy in the form of lipo-protein-nucleic acid complex (Reticulose) is of value. This substance might be included in the armamentarium of drugs used wherever radiation hazard is or may exist, whether in the treatment of carcinoma and other malignant conditions by x ray or radium, in the use of radioactive isotopes, or in potential disasters from the atom bomb. (auth)

1963

MODIFICATION OF SENSITIVITY TO X RADIATION BY MORPHINE SULFATE. J. B. Kahn, Jr. Proc. Soc. Exptl. Biol. Med. 78, 486-9(1951) Nov.

Morphine sulfate, injected intramuscularly into ZBC male mice 30 min before exposure to total-body x radiation, raises the LD_{50} of the radiation from 609 to 830 r. Possible mechanisms of this effect are discussed. (auth)

RADIATION SICKNESS

1964

Naval Medical Research Inst., Bethesda

PROTHROMBIN UTILIZATION IN FATAL RADIATION INJURY, by D. P. Jackson, E. P. Cronkite, G. J. Jacobs, and C. F. Behrens. June 26, 1951. 17p. (NP-3623; R5997)

Eight dogs subjected to 600 r whole-body radiation by the bilateral exposure technique died between the 9th and 15th postirradiation day. All dogs showed evidence of extensive diffuse hemorrhage prior to and after death. Changes in the hematocrit and leukocyte and platelet counts were typical of those usually observed for this range of x radiation. A slight terminal decrease in prothrombin concentration occurring in 4 dogs indicated that prothrombin utilization approaches zero from the 9th postirradiation day to death. The whole-blood clotting time was prolonged only after the utilization of prothrombin approached zero and the platelet level has fallen below 50,000/cc. At autopsy, the blood clotted promptly after the vessels were cut. The decrease in prothrombin utilization in these dogs may be produced by the progressive thrombocytopenia, a decrease in some accelerator, or an increase in some inhibitor. Results did not rule out the existence of a "first phase" anticoagulant. (NRS abst.)

1965

EFFECT OF ACTH ON THE MORTALITY OF IRRADIATED MICE. H. Betz. Compt. rend. soc. biol. 145, 1240-2(1951) Aug. (In French)

Adult C57 mice injected daily with 0.5 mg of ACTH for 7 days before irradiation with 700 r of 250-kv x rays had a lower rate of mortality than untreated controls, and there was 20% survival. However, when the daily injection was started after the irradiation, the mice died more rapidly than the controls; all succumbed by the 8th day, in contrast to the 11th day for controls. Mice injected intraperitoneally with 0.05 mg of KCN immediately before a 700-r x irradiation had a 75% survival rate without further treatment, but only a 30% rate when a daily 0.5-mg ACTH injection was begun after the irradiation. The ACTH clearly increases activity of the adrenal cortex, which in the irradiated animals is already excessively affected by radiation stress.

1966

RADIATION SICKNESS; A CLINICAL INVESTIGATION. Frank Ellis and Basil A. Stoll. J. Fac. Radiologists, 3, 207-22(1952) Jan.

This report is based on the results of treating 225 patients complaining of radiation sickness. On these patients, 296 drug trials were carried out according to a prearranged controlled plan. The drugs chosen for the experiment were benadryl, benzedrine, pyridoxin, dilute hydrochloric acid, and an inert tablet containing 5 gr of lactose as a control. Symptoms, doses, and results of treatment are presented graphically.

1967

POSSIBILITY OF TREATMENT OF RADIOACTIVITY RADIATION INJURY WITH MEDICINES. R. Lieberherr. Vierteljahrsschr. schweiz. Sanitätsoff. 29, 25-33(1952) Jan.

A short literature survey covering various aspects of the direct and indirect biological action of radiation, resistance of the organism, and chemotherapy. 55 references.

1968

RELATIONSHIP BETWEEN THE ADRENAL CORTEX AND RADIATION SICKNESS; A REVIEW OF THE LITERATURE AND A PRESENTATION OF NEW DATA. Edward C. Porter. Radiology 58, 246-58(1952) Feb.

The literature pertaining to the relationship of the adrenal gland to irradiation has been briefly reviewed. Thirty-six patients undergoing radiation therapy were studied by means of eosinophil counts; in 5 of them determination of 17-ketosteroid excretion levels was also carried out. With few exceptions a definite adrenal cortical response was noted in those patients in whom radiation sickness developed. No such response was noted in those without radiation sickness. It is believed that the adrenal response is a major factor in alleviating radiation sickness. (auth)

1969

IDENTIFICATION OF FLAVONOID COMPOUNDS BY FILTER PAPER CHROMATOGRAPHY. Thomas B. Gage, Carl D. Douglass, and Simon H. Wender. Anal. Chem. 23, 1582-5(1951) Nov.

The recent use of flavonoid compounds in the treatment of radiation injury and frostbite has lent new emphasis to the need for improved methods of identifying these pigments. A particular need for micromethods of separation and identification of flavonoid pigments in plant extracts has prompted the application of paper partition chromatography methods to this problem. The paper chromatographic behavior of 38 flavonoid-type compounds has been determined in 11 solvent systems. The visible and fluorescent colors produced by 8 chromogenic sprays when applied to the developed chromatograms have been tabulated. The use of paper chromatography coupled with chromogenic sprays presents an additional tool for the classification and identification of flavonoids obtained from natural sources or by synthesis. The method is of particular advantage in evaluating the efficiency of various separation or purification procedures. (auth)

1970

THE ISOLATION AND PURIFICATION OF MORIN ON AN ION-EXCHANGE RESIN. Quentin L. Morris, Thomas B. Gage, and Simon H. Wender. J. Am. Chem. Soc. 73, 3340-1(1951).

Amberlite IRC-50(H) synthetic cation exchange resin has been utilized for the isolation and purification of morin (2′,3,4′,-5,7-pentahydroxyflavone) from aqueous extracts of the heartwood of Chlorophora tinctoria. The morin is further purified, after elution from the column with ethyl alcohol, by recrystallization from acetic acid, conversion to the potassium salt, and re-adsorption on a fresh column of Amberlite IRC-50(H). The morin, thus prepared, compares favorably in its properties with authentic morin obtained by the more involved classical procedures. The method offers a practical low-cost procedure for the preparation of morin or other flavonoid pigments from plant extracts. (auth)

RADIOGRAPHY

1971

Los Alamos Scientific Lab.

X-RAY AND ELECTRON RADIOGRAPHY OF THIN SPECIMENS, by Arthur I. Berman and James W. Dutli. Oct. 1, 1951. 26p. (AECU-1885; LADC-1064)

Two radiographic methods are discussed for the examination of thin, low-density structures, using (1) low-energy x rays, and (2) high-energy electrons. The established techniques of x radiography are compared with the newly-developed techniques of electron radiography; the similarities and differences of the resulting images are noted together with those of visible light inspection.

RADIOTHERAPY

1972

THERAPEUTIC POTENTIALITIES OF RADIOISOTOPES. Marshall Brucer. Merck Rept. 61, 9-15(1952) Jan.

Medical uses of radioisotopes are discussed with regard to effectiveness in therapy, tracer applications in diagnosis, production feasibility, and half life of the isotope. Data are included on 25 radioisotopes, with half lives suitable for internal use, which can be produced by thermal neutron reactions in present-day facilities.

1973

THE RESPONSE OF HUMAN TISSUES TO RADIATION WITH SPECIAL REFERENCE TO DIFFERENTIATION. A. Glucksmann. Brit. J. Radiology 25, 38-43(1952) Jan.

The ability of penetrating radiations to change the type of differentiation or to affect its extent and degree under certain circumstances and in certain normal and malignant human tissues is discussed. Correlation of local histological prognosis with local clinical results of radiotherapy of tumors in approximately 200 patients for periods of from 1 to 12 years following initial treatment are tabulated.

1974

BETATRON CANCER THERAPY. Rodger A. Harvey, Lewis L. Haas, and John S. Laughlin. Radiology 58, 23-34 (1952) Jan.

Clinical trials of the 24-Mev betatron have shown advantageous dosage distribution. The extreme penetration and distribution of intensity of the x-ray beam require special attention in treatment planning. Integral volume doses for healthy tissue unavoidably irradiated and integral volume doses for the tumor itself give a numerical expression of the dose delivered in a patient. These quantities can be compared from patient to patient and may help to explain symptoms and complications. The figures will be particularly interesting when compared with figures from treatments at other energy levels.

1975

AN APPARATUS FOR THE RAPID ESTIMATION OF TRACER QUANTITIES OF RADIOACTIVE ISOTOPES IN EXCRETA. N. Veall and H. Vetter. Brit. J. Radiol. 25, 85-8(1950) Feb.

An apparatus is described, consisting of six large γ-ray counters connected in parallel to a suitable counting ratemeter. It will detect about 0.01 μc and will accurately measure quantities of the order of 1 μc of I^{131} or Na^{24} in samples of urine up to 2 litres and of feces up to 500 g without it being necessary to open the containers. P^{32} can be detected in microcurie amounts by bremsstrahlung, thus simplifying the monitoring of excreta from P^{32} therapy patients. The use of this equipment for measurements in live laboratory animals is suggested. In practice, a considerable saying time and effort is effected by the use of this method. (auth)

1976

A CRITICAL ANALYSIS OF THE QUANTITATIVE I^{131} THERAPY OF THYROTOXICOSIS. A. Stone Freedberg, George S. Kurland, David L. Chamovitz, and Alvin L. Ureles. J. Clin. Endocrinol. and Metab. 12, 86-111(1952) Jan.

The thyroid uptake and turnover (biologic half life) of a therapeutic dose of I^{131} can be determined from the uptake and turnover following a tracer dose. The predictability of the delivered thyroid radiation of a therapeutic dose of I^{131}, on the basis of the uptake and biologic half life following a tracer dose, is sufficiently accurate to allow for calculated I^{131} dosage. (auth)

1977

RADIOAUTOGRAPHY IN CANCER. Patrick J. Fitzgerald. Cancer 5, 166-94(1952) Jan.

A review of the published studies of the use of the radioautographic method has revealed its application to an unusual variety of biological problems, some directly related to the cancer field and others more pertinent to basic research problems. It is believed that the method has even greater potential value because of the increasing awareness of the necessity of studying biological phenomena at the cytological as well as at the species and organ levels. The method has the innate advantage of combining cytological structure specific chemical-element identification, and definite timing of the experiment. The problems of technique, limitations, use with allied methods, and the future possibilities of radioautography will be reported later. 267 references. (auth)

TOXICOLOGY STUDIES

1978

DIFFUSE PULMONARY GRANULOMATOSIS IN YOUNG WOMEN FOLLOWING EXPOSURE TO BERYLLIUM COM-

POUNDS IN THE MANUFACTURE OF RADIO TUBES; FURTHER OBSERVATIONS AND REPORT OF NINE ADDITIONAL CASES. Paul Slavin. Am. Rev. Tuberc. 65, 142-58(1952) Feb.

Nine cases of chronic pulmonary Be granulomatosis are reported, with results of post-mortem examinations in four. Details of exposure to Be dust in the manufacture of radio tubes are described. (auth)

1979

TOXICITY OF TRITIUM OXIDE TO MICE. Austin M. Brues, Agnes N. Stroud, and Leola Rietz. Proc. Soc. Exptl. Biol. Med. 79, 174-6(1952) Jan.

A 30-day median lethal dose of H_2^3O for CF No. 1 female mice is about 1 mc per g body weight when given in a single injection. The estimated radiation dosage is about 800 rep in the first 3 days and about 1000 rep in the first 12 days after injection. It is concluded that no unexpected factor of biological effectiveness exists for tritium β rays in relation to x or γ rays. (auth)

TRACER APPLICATIONS

1980

Oak Ridge National Lab.

CALCIUM TRANSLOCATION IN CALCIUM STARVED PEAS (abstract), by Herbert Jonas. [nd] 1p. (AECU-1877)

Peas (Alaska Bush) of the 1950 crop were grown during the summer in the greenhouse with aerated Hoagland's solution containing 18.71 m.e. of salt/liter at a pH of 5.5. Calcium was withdrawn from all plants at the full flowering stage 34 days after germination and substituted by $NaNO_3$. Twelve days later, 3.30 μc of Ca^{45} in 28.5 m.e. of Ca as $CaCl_2$ replaced the $NaNO_3$ for 40 out of 80 plants. All plants were harvested 4 to 8 days later at an age of 51 to 55 days when roots and stems of the minus Ca plants had striking deficiency symptoms. Several of the Ca^{45} plants served for radioautographs. They indicated definite Ca^{45} accumulations in the stems and branches, in the leaves of the lower thirds of the plants, and in the pods. The remaining tissue and organs did not contain significant amounts of photogenic tracers. Quantitative determinations showed 10 times more Ca^{45} in the lower and middle stems and branches than in their leaves and much more Ca^{45} in the carpels than in their seeds. The roots, as expected, were high in Ca^{45} due to their greater capability for ion exchange than for accumulation. The average rate of Ca^{45} accumulation in each part of all plants was inversely proportional to their total Ca content. In particular, starvation loss of total Ca in the middle stem sections caused a higher rate of Ca replacement. The pea pod acquired much Ca, probably at the expense of nearby stems and leaves. The roots of dosed plants contained less Ca than any other organ and less than the controls. Apparently continued starvation restricted the high-level Ca region to the lower plant sections, while a new supply of Ca tended to restore a more even Ca level all along the plants. The differences of stable and total Ca between dosed and control plants are additional evidence for the preferential removal from and relocation to new active regions. The excess of total Ca of the dosed plants above the controls in upper plant sections may also be due to a more efficient accumulation process in the healthier plants. This improved efficiency is not necessarily a localized function of the cessation of Ca starvation by Ca^{45} addition, which did not benefit quantitatively the stems above the top stipules and the regions below the second stipules. The lower stems and roots had a high accumulation ratio of Ca^{45} to total Ca. The upper leaves, though, being high in total Ca, had a very low ratio. The fruits, mostly located in the upper thirds of the plants, possessed an accumulation ratio almost as high as the lower leaves, which may be of agricultural significance for timing lime additions to the soil. (Entire report. Abstract of paper for presentation at Atlanta meeting of Sou. Sec., Am. Soc. Plant Physiol., Feb. 5, 1952.)

1981

Los Alamos Scientific Lab.

WATER EXCHANGES AND BARRIERS AS STUDIED BY THE USE OF HYDROGEN ISOTOPES, by Ernest A. Pinson. [nd] 26p. (AECU-1886; LADC-1111)

The physical properties of D and T in relation to concentrations of these isotopes which may be toxic to biological organisms and which determine the sensitivity of methods of assay are indicated. Studies of water exchange between the animal organism and the external environment using HDO and HTO as tracers show that (a) the exchange of water between the inspired air and body fluid in the lungs is nearly 100%, (b) the amount of water transferred from the gastrointestinal tract to the blood stream following ingestion is linear with time, (c) a permeable barrier exists in the outer skin through which water vapor may diffuse in either direction, and (d) within the limits of measuring sensitivity, all fluids lost from the body contain the same isotopic concentration of HDO or HTO as that prevailing in the water of the blood at the time of loss. HDO or HTO are useful as tracers in measuring water exchange across barriers which cannot be measured with H_2O because of the inability to distinguish one H_2O molecule from another. With HDO or HTO one can differentiate between the water exchanged and net water transferred. Using the radioactive character of T it may be possible in the future to localize the position of water molecules as they process through various barriers in exchange and equilibrium-establishing processes. 76 references.

1982

Brookhaven National Lab.

ORGANIZATION AND FUNCTION OF THE INORGANIC CONSTITUENTS OF NUCLEI, by D. F. Poulson and V. T. Bowen. Yale Univ. and Brookhaven National Lab. [nd] 37p. (BNL-1074)

In an investigation of the biological function of mineral elements in the nucleus and other cell organelles, histochemical and radioautographic studies were made of the uptake, tissue distribution, and excretion of Fe and Cu by various species of Drosophila larvae. The nuclear localization of Ca and Ba was also investigated. The relationship of these elements and of Mg, Zn, Co, Mn, Ni, and La to enzyme systems in nuclei is discussed.

1983

THE USE OF ISOTOPES IN AGRICULTURAL RESEARCH—I. P. A. Collier. Chemistry & Industry 51, 1122-4(1951) Dec.

A review of uses of radioactive isotopes as tracers in agricultural experiments is presented.

1984

THE USE OF ISOTOPES IN AGRICULTURAL RESEARCH—II. A. J. Low. Chemistry & Industry 51, 1124-8(1951) Dec.

A number of problems arising in agricultural studies employing radioisotopes as tracers are discussed.

1985

ORGAN ERYTHROCYTE AND PLASMA VOLUMES OF TUMOR-BEARING MICE; THE OLIGEMIA OF NEOPLASMS. R. H. Storey, L. Wish, and J. Furth. Cancer Research 11, 943-7(1951) Dec.

Direct determinations were made of the cell and plasma volumes of organs and tumors; on this basis, the organ and average body hematocrits were calculated. Each organ has a characteristic hematocrit with values diminishing in the following order: spleen, liver and lung, kidney. The blood volume of all tumors examined was much below that of these organs. Experiments indicate that this oligemia of tumors is real and not due to sluggish circulation.

1986

EFFECT OF CALCIUM STATUS, MASS OF CALCIUM ADMINISTERED AND AGE ON Ca^{45} METABOLISM IN THE RAT. Sam L. Hansard, C. L. Comar, and M. P. Plumlee. Proc. Soc. Exptl. Biol. Med. 78, 455-60(1951) Nov.

The fecal excretion of orally administered Ca^{45} is a sensitive indication of the calcium status of the rat. Placing normal rats on a low calcium diet for as little as 2 days greatly increased their ability to absorb Ca^{45} from the tract. The specific activity of labeled calcium at the site of absorption had little effect upon its absorption. In general, younger rats absorbed more Ca^{45} than did older ones although there was no significant difference between 6½ and 16-month-old animals. For meaningful studies of this type, interpretations must include consideration of exchange reactions, and care must be given to initial selection of diets and animals, preparation of animals for the experiment, and dietary management during the experimental period. (auth)

1987

THERMODYNAMIC STUDY OF AN ENZYME–SUBSTRATE COMPLEX OF CHYMOTRYPSIN. I. David G. Doherty and Fred Vaslow. J. Am. Chem. Soc. 74, 931-6(1952) Feb. 20.

Experiments with O^{18}-enriched water have shown that chymotrypsin will catalyze the carboxyl oxygen exchange of acetyl-3,5-dibromo-L-tyrosine and hence this compound is a substrate for chymotrypsin. No net change occurs in the exchange reaction, making it possible to make direct equilibrium measurements of the enzyme-substrate binding. Using a radioactive bromine-labeled substrate and the equilibrium dialysis technique, the binding has been measured as a function of pH, temperature and substrate concentration. It is found that one substrate molecule is bound per chymotrypsin molecule of molecular weight 22,000. There is an apparent correlation between the variation of the thermodynamic functions of the enzyme substrate bond, and the activity of the enzyme as a function of pH. (auth)

CHEMISTRY

1988

[Ames Lab.]

THE PRODUCTION OF BERYLLIUM BY THE METALLOTHERMIC REDUCTION OF BERYLLIUM FLUORIDE, by F. H. Spedding, H. A. Wilhelm, W. H. Keller, and Charles Neher. Sept. 30, 1945. Decl. with deletions Feb. 20, 1952. 13p. (AECD-3315)

The production of Be by the metallothermic reduction of its fluoride has been attempted, both in closed bombs and in open reaction chambers. Reduction of BeF_2 with Ca or Mg alone in closed bombs failed to fuse the products. The use of $ZnCl_2$ and $PbCl_2$ as boosters fused both metal and slag and resulted in separation of the metals from each other and from the slag. However the Be in neither case was as free of inclusions as was desirable. Sulfur as the booster with mixtures of Ca and Mg produced clean, massive metal, but frequent burn-outs at the gasket of the bomb caused the process to be dangerous and wasteful. The use of Mg as the reductant was very desirable economically and the open reaction chamber was mechanically more convenient and safe than the closed bomb. Charges of BeF_2 and Mg reacted smoothly when heated by induction in graphite crucibles and on continued heating the metal and slag separated fairly well. It was found that an addition of $CaCl_2$ to the top of the charge facilitated the separation a great deal. Very clean, massive metal has been produced by this procedure. (auth)

1989

Oak Ridge National Lab.

THE APPLICATION OF ION-EXCHANGE CHROMATOGRAPHY TO NUCLEOTIDES, AMINO ACIDS, SUGARS, AND RELATED SUBSTANCES (abstract), by Waldo E. Cohn. [nd] 1p. (AECU-1874)

The capacity, stability, homogeneity, and reproducibility of the modern synthetic ion exchanger have made possible the separation of hitherto difficultly separable substances. In the inorganic field, the affinity of ion for exchanger is generally controlled through a pH-dependent complex (e.g., the rare earth citrates). Bio-organic substances, such as nucleotides and amino acids, are amphoteric electrolytes containing acid and basic groups of varying strength. The degree of ionization of each such group, and hence the net charge of the total molecule, is pH dependent. Thus, pH control can serve as the means of separation of mixtures of such substances by controlling the net charge and, through this, the affinity for the exchanger. Structural characteristics of the compounds themselves modify the apparent net-charge criterion. Neutral substances, such as sugars, can be separated by forming complexes with ionized substances. In the case of sugar-borate complexes, the affinity is controlled by the degree of complex formation, which in turn depends on the sugar structure, rather than upon pH control. The application of these principles has resulted in the discovery of ten new nucleotides derived from nucleic acids and in methods for the quantitative resolution of mixtures of amino acids, neutral sugars, phosphorylated derivatives, and organic bases. Examples of these applications will be presented. (Entire report. Abstract of paper for Buffalo meeting of Am. Chem. Soc., March 23, 1952.)

1990

Massachusetts Inst. of Tech.

THE ACTIVITY OF SULFUR IN LIQUID IRON AND STEEL, by Charles W. Sherman and John Chipman. [nd] 31p. (AECU-1869)

The chemical behavior of S in liquid Fe at 1690°C is investigated through study of the equilibrium:

$$H_2 + \underline{S} = H_2S;\ K = p_{H_2S}/(p_{H_2}\cdot a_S)$$

From the known equilibrium constant of the reaction and the experimental data, the activity of sulfur in the melt is determined. The activity coefficient of S defined as $f_S = a_S/\%\ S$ is increased by P, C, Al, and Si, named in order of increasing effect per atom. It is decreased by Cu and Mn, the latter having the larger effect. A simi-empirical method is devised for calculating the activity coefficient of S in complex solutions of four or more components. This method is tested against extensive data on solutions of this kind. The activity coefficient of S in Fe of typical blast-furnace composition is about 5.4 to 6.3 and increases with increasing silicon. (auth)

1991

Explosives Research and Development Establishment, Waltham Abbey, Essex (England)

THE DETERMINATION OF THE IONIC PRODUCT OF MIXTURES OF HYDROGEN PEROXIDE AND WATER (Interim Report), by A. G. Mitchell. July 1951. 16p. (ERDE-4/EMR/51)

The measurement of the ionic product of mixtures of H_2O_2 and H_2O by a salt hydrolysis method and by an acid-alkali titration method is described. Values were obtained up to 84% H_2O_2 and results of the two methods were in good agreement. Calculated values for the specific conductivity of H_2O-H_2O_2 mixtures are tabulated.

1992
Ames Lab.
THE CATALYTIC EFFECT OF ANIONS ON REDUCTION REACTIONS INVOLVING METAL IONS, by Richard C. Pinkerton and Frederick R. Duke. June 1951. 50p. (ISC-192)

A model is proposed for a general activated complex AXB in oxidation-reduction reactions involving two metal ions (A) and (B). The symbol (X) would indicate the anions or other groupings which might be present, and which ordinarily would be complexed to the metals separately. The effectiveness of (X) is related to its ability to be oxidized or reduced in itself. In the case that (X) consists of oxidizable anions, the probability of electron transfer from (X) to the oxidizing metal (A) is correlated with the strength (energy) of the bond between (X) and (A). Two previous explanations of the catalytic effect of anions on such reactions and a series of three experiments to test the validity of the proposed model are discussed. The experiments involved the disproportionation of U (V) in light and heavy water, the halide-catalyzed ferric-stannous reactions, and the reduction of some Co (III) complexes with stannite.

1993
Pennsylvania State Coll.
STUDIES ON COORDINATION COMPOUNDS. IV. A COMPARISON OF THE CHELATING TENDENCIES OF BETA-DIKETONES WITH DIVALENT METALS, by LeGrand G. Van Uitert, W. Conard Fernelius, and Bodie E. Douglas. Jan. 16, 1952. 15p. (NYO-3369)

The formation constants for the chelate compounds formed by a series of divalent metal ions with a group of β-diketones have been determined and compared. The general order of increasing stability of these chelate compounds using nitrate salts and β-diketones with aromatic ring end-groups in 75 vol. % dioxane solution is: Ba, Sr, Ca, Mg, Cd, Mn, Pb, Zn, Co, Mi, Fe, (Cu, Be), Hg (log K_1). The stability of the chelate compounds increase with the electronegativities of the metal ions involved and hence are a function of the covalent character of the resulting bonds. The divalent metal ions Fe, Ni, Co, Zn, Mn, and Mg form complex salts of the general formula $NaMCh_3 \cdot C_4H_8O_2$ with acetylacetone (= HCh). Nickel and zinc form soluble chelate compounds containing the stoichiometric ratios $NiCh_2$, $ZnCh_2$, NiChCl, ZnChCl, and Ni(OH)Ch and the insoluble chelate compounds $NaNiCh_3 \cdot C_4H_8O_2$, $NaZnCh_3 \cdot C_4H_8O_2$, $Zn_2(OH)Ch_3$, and $Zn_5Ch_2(OH)_7Cl$ with acetylacetone. (auth)

1994
Pennsylvania State Coll.
STUDIES ON COORDINATION COMPOUNDS. V; THE EFFECTS OF SALT ANION AND OF SOLVENT UPON THE CHELATION OF BETA-DIKETONES, by LeGrand G. Van Uitert, W. Conard Fernelius, and Bodie E. Douglas. Jan. 18, 1952. 13p. (NYO-3370)

The divalent metal salts are extensively associated beyond the degree expected to conform with strong electrolyte behavior in a solution consisting of 75 vol. % dioxane and 25 vol. % water. This does not appear to be the case for the nitrate or perchlorate salts of the monochelated divalent cations of Mg, Mn, Co, Zn, Ni, Fe, and Cu. The true ratio of the first to the second formation constants, K_{f_1}/K_{f_2}, for the chelate complexes of β-diketones formed in such solutions is obscured by the leveling effects of the salt anions and the water of hydration upon the divalent metal salts. As these factors are reduced, the apparent ratio increases. In general the log K_{f_1} and log K_{f_2} values vary linearly with n_2 (the mole fraction of dioxane in solution) and essentially parallel the pK_D values for the enol form of the chelating agent. (auth)

1995
Pennsylvania State Coll.
STUDIES ON COORDINATION COMPOUNDS. VI. MEASUREMENTS OF CHELATION IN ETHANOL SOLUTION, by LeGrand G. Van Uitert, W. Conard Fernelius, and Bodie E. Douglas. Jan. 21, 1952. 11p. (NYO-3371)

Potentiometric studies of the chelation of divalent Ni by acetylacetone, malonates, and β-keto esters in essentially absolute ethanol have been made. The value of log U_H for a mean stoichiometric electrolyte molarity of 4×10^{-3} is 1.85 ± 0.15. The pK_D value for acetylacetone is about one log unit higher in absolute alcohol than in a water-dioxane mixture which has the same gross dielectric constant as ethanol. The log of the ratio of the first chelate compound formation constant to the second (log K_{f_1}/K_{f_2}) is about 5.0 for Ni chelate compounds in absolute ethanol. The β-keto esters form dichelate compounds with nickel while the malonates form only the monochelate compounds. The iron OEt^- combines with $NiOEt^+$ at a B-value (pH-meter reading) that is 3 log units lower than that at which it combines with $NiCh^+$. (auth)

1996
Louisiana State Univ.
IMPLICATIONS OF THE KINETICS OF IONIC RECOMBINATION WITH REGARD TO SOME ELECTROCHEMICAL PROCESSES, by Paul Delahay. Sept. 1951. 15p. (NP-3627; Technical Report No. 3; U-20199)

On the basis of Onsager's theory (J. Chem Phys. 2, 599 (1934)) of ionic recombination, it is shown that the rate of dissociation of H_2O is too low to account for experimental current densities in the electrolytic generation of H in neutral or alkaline solutions. It is concluded that the assumption of Eyring, Glasstone, and Laidler (J. Chem. Phys. 7, 1053(1939)), who maintained that H_2O is mainly the species reduced in these solutions, is valid. Polarographic data indicate that the overvoltage for the reduction of H_2O at the dropping Hg electrode is approximately 1 v larger than the overvoltage for the reduction of H_3O^+. Equations are developed which indicate that, in neutral and alkaline solutions, the buffering action of a system of the type HA/A^- involved in an electrolytic reduction consuming H_3O^+ can be accounted for only by assuming that molecules HA are consumed in the electrode process. (NRS abst.)

1997
Oak Ridge National Lab.
STUDIES ON THE ANALYSIS FOR AND THE PREPARATION OF FLAVONOID COMPOUNDS (thesis), by Carl D. Douglass. Oak Ridge National Lab. and Oklahoma Univ. [nd] 106p. (ORNL-1206)

The chemical structure, paper chromatographic separation and characterization, and isolation of pigments from flavonoid compounds are discussed. Methods of preparation of flavone derivatives, both labeled and unlabeled, are included.

1998
THE HEAT OF COMBUSTION OF INDIUM. Charles E. Holley, Jr., Elmer J. Huber, Jr., and E. H. Meierkord. J. Am. Chem. Soc. 74, 1084(1952) Feb. 20.

The heat of combustion of In in an O_2-bomb calorimeter at 25 atm and 24.6°C initial temperature was determined to be 4016.1 ± 7.5 abs joules/g (959.8 ± 1.8 cal/g). This value leads to $\Delta E_{25} = -921.8 \pm 1.6$ abs kjoules/mole for the formation of In_2O_3, or $\Delta H_{25} = -925.8 \pm 1.6$ abs kjoules/mole (−221.27 ± 0.40 kcal/mole).

1999
THE SOLUBILITY OF BISMUTH IN MIXTURES OF BISMUTH CHLORIDE WITH OTHER CHLORIDES. George Cleary and Daniel Cubicciotti. J. Am. Chem. Soc. 74, 557 (1952) Jan. 20.

Two separate determinations of the solubility of Bi in its chloride gave 47.3 and 47.8 mole % Bi in the final mixture at 450°C. The effect of added salts on the solubility of the Bi is shown. Cuprous chloride reduces the solubility more than $ZnCl_2$, and NaCl more than $CaCl_2$. Thus with salts of metals of about the same electropositiveness, the larger the anion to cation ratio, the less effective the salt in reducing the solubility of the metal. For salts of the same anion to cation ratio, the more electropositive the metal of the cation, the more effective the salt in reducing the solubility.

2000

CHEMISTRY OF TECHNETIUM. I. PREPARATION OF TECHNETIUM HEPTOXIDE. G. E. Boyd, J. W. Cobble, C. M. Nelson, and W. T. Smith, Jr. J. Am. Chem. Soc. 74, 556-7(1952) Jan. 20.

Quantities of Tc metal were burned, and the light-yellow crystalline oxide (m.p. 119.5 ± 0.1°C) formed was purified by repeated sublimations into cooler portions of the quartz reaction tube. The oxide, which is very hygroscopic, dissolved in water to give a pink solution whose color disappeared with dilution. A potentiometric pH titration was performed using 0.05 f NH_4OH. The titration curve, which was characteristic of a strong monobasic acid, showed but one inflection point. Pure NH_4TcO_4 is nonhygroscopic and shows no decomposition when kept in air at 100°C for several hours. It was concluded that the correct formula for the light-yellow oxide produced by heating Tc metal in dry O_2 at 400 to 600°C is Tc_2O_7. The intense ultraviolet absorption of pertechnetate ion in aqueous solutions may be employed for the spectrophotometric determination of Tc(VII). Beer's law was found to hold rather well up to concentrations of 10^{-3}M for wave lengths near both maxima (i.e., 2470 and 2890A). As little as 10^{-8}g of Tc ,ay be detected. The dark-red crystals formed on evaporating aqueous solutions of Tc_2O_7 correspond to $Tc_2O_7 \cdot H_2O$, or to anhydrous pertechnic acid, $HTcO_4$.

2001

THE OXIDATION OF INDIUM TRISULFIDE. M. F. Stubbs. J. Am. Chem. Soc. 74, 1098-9(1952) Feb. 20.

Pure In_2S_3 was heated in air up to 280°C with only superficial oxidation. In the temperature range 300 to 460°C the sulfide was gradually oxidized to a mixture of sulfate and oxide, the relative amounts depending on the surface exposed, the temperature, and the period of heating. There was no evidence of InS formation.

2002

ON THE STABILITY OF THE OXALATE COMPLEX OF PROTACTINIUM. G. Bouissières and S. Odiot. Bull. soc. chim. France, 918-19(1951) Nov.-Dec. (In French)

Freshly precipitated $Pa(OH)_5$ dissolves rapidly in warm aqueous oxalic acid. A 3M oxalic solution containing 0.15 mg of Pa/cc (0.65 millimoles/l) was thus prepared, and 1-cc portions were used to test qualitatively the chemistry of the oxalate complex. Addition of NH_4OH at room temperature resulted in persistent turbidity at pH 5 to 6; precipitation was not complete until pH 8 to 9, and reacidification with HCl or H_2SO_4 resulted in rapid and complete dissolution. Addition of an equal volume of N HCl to the original solution had no effect in the cold, but a white crystalline precipitate containing ~90% of the Pa formed in warm solutions. This precipitate did not dissolve in 1 cc of warm 5N HCl, but dissolved immediately and completely in 8N HCl. The behavior of H_2SO_4 was similar, but only ~20% of the Pa precipitated. The existence of a soluble complex between Pa and oxalate is clear. Analogy with the behavior of Th is discussed.

2003

CONTRIBUTIONS TO THE CHEMISTRY OF THE ELEMENTS NIOBIUM AND TANTALUM. VII. NOTE ON THE BINARY SYSTEM NIOBIUM PENTACHLORIDE–TANTALUM PENTACHLORIDE. Harald Schäfer and Christel Pietruck. Z. anorg. u. allgem. Chem. 267, 174-80(1951) Dec. (In German)

Results of phase studies show that $NbCl_5$ melts at 204.7°C, $TaCl_5$ at 216.5°C, and that the chlorides form ideal mixed crystals over the entire temperature range.

2004

SYSTEMATIC CHEMISTRY OF THE TRANSITION ELEMENTS; RECENT CHEMISTRY OF TITANIUM, ZIRCONIUM, AND HAFNIUM. F. K. McTaggart. Revs. Pure Applied Chem. 1, 152-71(1951) Sept.

The discovery and occurrence of Ti, Hf, and Zr are outlined. A brief discussion is given on the separation of Hf from Zr, methods of estimation of Hf, preparation of these metals, investigation of the systems Ti-H and Zr-H, formation of Ti, Hf, and Zr hydrides, preparation of Ti and Zr oxides, chemical properties of the esters of Ti, and formulas of Zr ions in aqueous salt solutions.

2005

FRANCIUM, ELEMENT 87. Marguerite Perey. Bull. soc. chim. France, 779-85(1951) Nov.-Dec. (In French)

The discoverer of AcK (Fr^{223}), the 21-min product of 1.2% of the disintegrations of 22-yr Ac^{227}, reviews briefly the radioactive and chemical properties of the element and treats in some detail its biological applications. Distributions of Fr in the tissues (including experimental sarcomas) of the rat following subcutaneous injection is shown graphically. The difficulty of working with such a short-lived isotope is considered. A radiometric method of determining Ac, whatever its purity or state of radioequilibrium, by means of the β rays of AcK is mentioned. 35 references.

2006

THE VISCOSITIES OF LIQUID LITHIUM, RUBIDIUM AND CAESIUM. E. N. da C. Andrade and E. R. Dobbs. Proc. Roy. Soc. (London) 211A, 12-30(1952) Feb. 7.

The oscillating-sphere method has been applied to find the viscosities of liquid Li, Rb, and Cs from the neighborhood of the melting point upwards over a range of temperatures. For Li it was necessary to construct a Ni-lined metal sphere, as liquid Li attacks glass and many metals. This involves certain technical difficulties, which have been overcome. The peculiarities of the three metals made necessary the elaboration of special methods of handling. Measurements for Na and K having been already made, the viscosities of all the alkali metals are now available. The results, as regards both the absolute values of the melting-point viscosities and the variation of viscosity with temperature, accord well with the simple theory put forward by one of the authors some years ago. The values for the characteristic temperature which can on this theory be derived from the melting-point viscosities agree well with the values derived from the specific heats for the first three metals, and are calculated for Rb and Cs, for which values derived from other sources are not available. (auth)

2007

FORCE CONSTANTS AND CALCULATED THERMODYNAMIC PROPERTIES OF NITROSYL FLUORIDE. C. V. Stephenson and E. A. Jones. J. Chem. Phys. 20, 135-6(1952) Jan.

The force constants for NOF were calculated using the Wilson FG Matrix method. Unique values could not be calculated, since the number of force constants exceeded the number of fundamental vibrations. However, upper and lower limits have been set for the force constants. The thermodynamic functions for NOF were calculated for temperatures ranging from 273.16 to 1500°K, using the rigid rotator, harmonic oscillator approximation.

2008

NICKEL PLATING BY CHEMICAL REDUCTION. I. EFFECT OF THE BASIS METAL. Robert A. Powers and Norman Hackerman. J. Phys. Chem. 56, 187-8(1952) Feb.

It has been shown that surface configuration of the supporting substance is not of major importance in inducing nickel deposition by chemical reduction either through a similarity to the nickel lattice or through catalytic activity due to surface geometry. (auth)

2009

LOW TEMPERATURE HEAT CAPACITY, ENTROPY AT 298.16°K AND HIGH TEMPERATURE HEAT CONTENT OF TITANIUM DISULFIDE. S. S. Todd and J. P. Coughlin. J. Am. Chem. Soc. 74, 525-6(1952) Jan. 20.

The low temperature heat capacity of TiS_2 was measured throughout the temperature range from 51 to 298°K. The entropy was evaluated as $S°_{289.16} = 18.73 \pm 0.15$ cal/deg/-mole. The high-temperature heat content of TiS_2 was measured throughout the temperature range from 298 to 1010°K. A transition, involving no isothermal heat absorption but corresponding to a maximum in heat capacity, was found at 420°K. (auth)

AEROSOLS

2010

Illinois Univ., Engineering Experiment Station

THERMAL FORCE ON AN AEROSOL PARTICLE IN A TEMPERATURE GRADIENT, by R. L. Saxton and W. E. Ranz. Dec. 31, 1951. 44p. (SO-1007; Technical Report No. 6)

Data on the thermal forces acting on aerosol particles in a temperature gradient are relatively few. Measurements are reported here on droplets of paraffin oil and castor oil suspended in air, showing the effect of temperature gradient, particle size, and particle material. The thermal force is directly proportional to the temperature gradient prevailing in the gas, and to the particle diameter. It is an inverse function of the thermal conductivity of the aerosol material. The agreement between the experimental data and the theory of P. S. Epstein (Z. Physik 54, 537(1929)) is satisfactory, a fortunate result in view of the approximations to the actual physical situation made in the derivation of the theoretical equation. The velocity of migration of aerosol particles in a temperature gradient can be estimated from Epstein's formula. (auth)

ANALYTICAL PROCEDURES

2011

A HIGH PRECISION METHOD FOR THE VOLUMETRIC DETERMINATION OF URANIUM, by M. S. Richmond and C. J. Rodden. [nd] Decl. with deletions Sept. 23, 1948. 15p. (AECD-3316; CJR-RM-639)

Uranium was separated from Cu, Fe, and Ni by electrolysis with a Hg cathode. Tetravalent U obtained by reduction in a Jones reductor followed by aeration, was assayed by adding a slight excess of weighed potassium dichromate which was then titrated potentiometrically with 0.01 N ferrous sulfate. The values for the U_3O_8 content of standard sample MS-St determined by direct assay of 14 samples, ranged from 99.91 to 99.96% with a mean of 99.93 ± 0.02%. Samples which were electrolyzed before assay gave similar precision but slightly lower results. (auth)

2012

Ames Lab.

DETERMINATION OF TRACE QUANTITIES OF IRON IN ZIRCONIUM AND ITS COMPOUNDS, by Augustus Sidney Ayers and Charles V. Banks. Aug. 1950. 68p. (ISC-152)

The literature on the determination of small amounts of Fe has been surveyed and 133 references are included. The spectrophotometric 1,10-phenanthroline method with tartrate to prevent precipitation of hydrous zirconium oxides in neutral solution has been found to permit analysis of various Zr materials in the absence of such materials as Zn and Ni. The sulfosalicylate method was applicable to Zr compounds even in the presence of Zn and Ni, but the method was limited to samples high in Fe content by the large blank due to Fe in the sulfosalicylic acid reagent. Recommended procedures for analysis for Fe in Zr metal and some of its compounds are included.

2013

Knolls Atomic Power Lab.

THE DETERMINATION OF MERCURY IN NaK, by F. P. Landis and J. R. Pelrine. Jan. 31, 1952. 21p. (KAPL-674)

A spectrochemical method has been developed for the determination of Hg in Na, or Na-K alloy in concentrations as low as 0.5 ppm. The Hg is isolated from the Na or NaK by amalgamation on Cu powder in an acidified chloride solution. The dried Cu powder is arced in a conventional d-c arc, using a special electrode cap to ensure reproducible volatilization of the Hg. The analysis line used is Hg: 2536.5. No internal standard is used, and the accuracy of the method is approximately ±20% of the amount of Hg present. (auth)

2014

ANALYTICAL CHEMISTRY OF ZIRCONIUM. PART III. SALICYLIC AND PHENOXYACETIC ACIDS. T. Viswanadha Sastry and Bh. S. V. Raghava Rao. J. Indian Chem. Soc. 28, 530-2(1951) Sept.

Two reagents, salicylic acid and phenoxyacetic acid, have been suggested for the separation and estimation of Zr from many other associated elements. Ti and quadrivalent Ce interfere. Th is removed in a double precipitation. Fe may be removed in a double precipitation ordinarily or in a single precipitation by complexing with excess of ammonium sulfocyanide. Other divalent and trivalent elements present no difficulty. Salicylic acid acts best in solutions 0.18N in HCl and phenoxyacetic acid in solutions 0.24N in HCl. (auth)

2015

ANALYTICAL CHEMISTRY OF THORIUM. PART VIII. ALIPHATIC DICARBOXYLIC ACIDS. T. V. S. Suryanarayana and Bh. S. V. Raghava Rao. J. Indian Chem. Soc. 28, 511-14 (1951) Sept.

In a study of the separation of Th from the cerite earths by aliphatic dicarboxylic acids, succinic acid was found to form a complex with Th, preventing quantitative precipitation. Adipic acid was found to precipitate Th quantitatively and to free Th completely from the cerite earths by a double precipitation in the pH range 4.2 to 4.4. Th in monazite ore has been estimated satisfactorily by this latter method.

2016

THE PHOTOMETRIC DETERMINATION OF ALUMINIUM IN MAGNESIUM ALLOYS BY MEANS OF SOLOCHROME CYANINE-RS. A. Bacon. Analyst 77, 90-7(1952) Feb.

The application of Solochrome Cyanine-RS to the determination of Al in Mg alloys containing alloying additions of Al in the ranges 0 to 0.35% of Al and up to 14% of Al and also to the detection of trace amounts of Al up to 0.02% is described. Interference by Zn, Ni, Mn, and Cd is negligible; Cu and Fe interference is discussed in detail. The determination of Al in the presence of phosphate also is described. For alloying additions in the ranges stated, the method has an accuracy of ±1% of the maximum of the Al range covered. With metal containing less than 0.025% of Al the results are reproducible to ±0.0005% of Al.

2017

THE DETERMINATION OF THORIUM AND ITS SEPARATION FROM THE RARE EARTHS BY MEANS OF BENZOIC ACID. M. Venkataramaniah, C. Lakshman Rao, and Bh. S. V. Raghava Rao. Analyst 77, 103-5(1952) Feb.

To solutions containing not more than 0.1 g of ThO_2, but as little as 0.0017 g, together with large amounts of rare-earth and other impurities, was added 10 g of NH_4Cl and enough H_2O to dilute to 100 ml. The pH was adjusted to between 2.2 and 2.6, the solution was boiled, and to it was added, with stirring, 100 ml of a boiling 2% solution of benzoic acid. The curdy precipitate that first formed became crystalline on boiling for 10 min and then settled rapidly. The solution was let stand for 5 min and then filtered through a Whatman No. 41 filter paper. The precipitate was washed with a hot 25% benzoic acid solution and ignited to ThO_2. In no case was the error greater than 0.2 mg. The method is satisfactory for monazite analysis.

2018

DETERMINATION OF CHROMIUM, VANADIUM, AND MOLYBDENUM BY A RADIOACTIVE INDICATOR METHOD. J. Govaerts and Carlos Barcia-Goyanes. Anal. Chim. Acta 6, 121-5(1952) Feb. (In French)

An aqueous solution of Ag^{110}-labeled $AgNO_3$ may be used to precipitate Ag_2CrO_4, $AgVO_3$, or Ag_2MoO_4. Standard curves relating activity of the precipitate to the quantity of metal present are plotted.

2019

ANALYTICAL CHEMISTRY OF THORIUM. PART IX. DELAYED PRECIPITATION OR PRECIPITATION FROM HOMOGENEOUS SOLUTION. C. Lakshman Rao, M. Venkataramaniah, and Bh. S. V. Raghava Rao. J. Indian Chem. Soc. 28, 515-18(1951) Sept.

Two new reagents for the estimation of Th and its separation from cerite earths have been found. One, ammonium picrate, precipitates Th completely in the pH range 4.8 to 5.2 on heating for about 15 min on a boiling water bath. This precipitation takes place gradually during heating and exhibits a behavior similar to that of precipitation from homogeneous solution as studied by Willard and co-workers (Anal. Chem. 20, 165(1948)). The second reagent, ammonium salt of 2,4-dinitrophenol, functions satisfactorily in the pH range 4.8 to 5.2. Th in monazite has been successfully estimated with both reagents. (auth)

ATOMIC WEIGHTS AND PERIODIC SYSTEMS

2020

THE PERIODIC LAW IN MATHEMATICAL FORM. Reino Hakala. J. Phys. Chem. 56, 172-81(1952) Feb.

Desiderata of the most useful form of periodic table are given. Attention is focused on Janet's table which best meets these requirements. A compact array that describes the order in which the subshells of atoms are filled is given. It most clearly brings out the systematics involved and Janet's table can be derived directly from it. The "general observation that alternate members of a valency group in the periodic table show the greatest chemical resemblance" is provided with a firm mathematical foundation by an analysis of this array. Equations relating the atomic numbers of the alkaline-earth elements and helium (because of its similar electronic configuration) to the principal and orbital quantum numbers of their subshells of highest energy are derived on the basis of an extrapolation of the order in which the subshells of atoms are filled. An equation that describes the author's version of Janet's table is derived. It relates the atomic numbers of the elements to their positions in the table. Various forms of it are given. The periodic law is given mathematical expression. This relates the atomic numbers of the elements to their positions in any periodic table that is based upon the electron configurations of the elements. Fundamentally, then, it relates atomic numbers to electron configurations. (The equation neglects changes in configuration due to the exceptional stability of completed, half-completed, and empty shells. However, these changes occur in only 10% of the known elements and do not always occur when expected, e.g., W has the configuration $6s^25d^4$ instead of $6s5d^5$.) An introduction is given to the determination of general mathematical expressions for both periodic and non-periodic properties of the elements and their compounds. A method is outlined by which expressions may be found that relate several properties to one another independent of electron configurations and positions in periodic tables. A simple way of evaluating the arbitrary constants of functions $\phi(y) = a_0 + a_1f(x) + \ldots + a_n[f(x)]^n$ is outlined. A known formula of finite differences is generalized to give other formulas which find application in evaluating these arbitrary constants. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2021

Battelle Memorial Inst.

CREEP IN METALS, by A. D. Schwope, F. R. Shober, and L. R. Jackson. Feb. 1952. 52p. (NACA-TN-2618)

This report covers phases of an investigation of the fundamentals of creep in metals. Results of a study of creep in single crystals of high-purity aluminum are presented and discussed. It is shown that at low stresses the creep phenomenon appears to be consistent with Mott and Nabarro's theory of exhaustion creep while at higher stresses results appear to be more in accord with ideas expressed by Andrade. (NACA abst.)

2022

Carnegie Inst. of Tech.

ON THE ROLE OF GRAIN BOUNDARIES IN CREEP, by M. R. Achter and R. Smoluchowski. Jan 10, 1952. 6p. (NYO-3180)

An analysis of Chalmers' data (Proc. Roy. Soc. (London) 162, 120(1937)) on creep of bicrystals of tin is in agreement with the expected influence of high density crystallographic planes. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

2023

THE ISOMERIZATION OF D-GLUCOSE BY ALKALI IN D_2O AT 25°. John C. Sowden and Robert Schaffer. J. Am. Chem. Soc. 74, 505-7(1952) Jan. 20.

The Lobry de Bruyn and Alberda van Ekenstein isomerization reaction of D-glucose to D-fructose and D-mannose is shown to occur in heavy water with the introduction of carbon-bound deuterium into the products in accord with the classical enediol mechanism. By the use of radioisotopic dilution analyses for D-fructose and D-glucose and of a corrected phenylhydrazone precipitation method for D-mannose, the extents of formation of these products in the reaction mixture were determined also, and the combination of data was correlated with the reactivities of the individual sugars. (auth)

2024

PHASE TRANSITION OF $ND_4D_2PO_4$. B. T. Matthias. Phys. Rev. 85, 141(1952) Jan. 1.

Ammonium dihydrogen phosphate, though isomorphous with KH_2PO_4, does not become ferroelectric. Instead, at

148°K it undergoes a transition which splits the crystal into many small fragments. This transition has been investigated by replacing all the H by D. The crystals were of the same habit as the corresponding hydrogen salt. Their transition temperature, however, was shifted from 148 to 242°K. It is concluded that the transition in the ammonium salt is an order-disorder transition of the X_2PO_4 (X = H or D) groups, and that the principal effect of the nonspherical symmetric ammonia ion is to prevent the occurrence of a spontaneous polarization, i.e., ferroelectricity.

2025

MOLAR VOLUMES OF LIQUID DEUTERIUM AND OF A 1 : 1 DEUTERIUM-TRITIUM MIXTURE, 19.5 TO 24.5°K. Eugene C. Kerr. J. Am. Chem. Soc. 74, 824-5(1952) Feb. 5

This report was issued and indexed as AECD-3211 (abstract NSA 5-5084) and differs only in the equation for the T_2-D_2 mixture: V_M (cc/mole) = 18.555 (previously 18.155) + $0.1294T + 0.004203T^2$.

FLUORINE AND FLUORINE COMPOUNDS

2026

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF CARBON MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Oct. 1, 1951. 7p. (NBS-1164; U20677)

Molecular constants for the ground state of CF reported by Andrews and Barrow (Proc. Phys. Soc. (London) 64A, 481 (1951)) were used to calculate CF ideal gas thermal properties. Terms due to anharmonicity, vibration-rotation coupling, and doublet electronic ground state were added to the equation for the translation plus rigid rotator contributions. Heat-capacity, ΔS, ΔH, and ΔF functions are listed in dimensionless units at temperature intervals from 50 to 5000°K. A heat of formation value of 74 kg-cal/mole for CF at 0°K was obtained from the dissociation energies of CF and F_2 and the heat of sublimation of C. (NRS abst.)

2027

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF CHLORINE MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Dec. 1, 1951. 7p. (NBS-1196; U20679)

Heat-capacity, heat-content, ΔS, and ΔF functions are given in dimensionless units for ClF in the ideal-gas state between 50 and 5000°K. The functions were calculated separately from sepctroscopic data of Gilbert et al. (Phys. Rev. 76, 1723(1949)) and Nielsen and Jones (Phys. Rev. 83, 485(1951)) for $Cl^{35}F$ and $Cl^{37}F$; results were weighted in direct proportion to their relative abundance to give a composite harmonic-oscillator contribution for the mixture. Terms due to anharmonicity and vibration-rotation coupling, assumed equal to those of predominant species $Cl^{35}F$, were added to the translation and rigid-rotator contributions. The estimated uncertainty is less than 0.2% below 1000°K and 1% at 5000°K. (NRS abst.)

2028

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS; HEAT CAPACITY, ENTHALPY, FREE ENERGY AND ENTROPY OF MONATOMIC FLUORINE IN THE IDEAL GASEOUS STATE, by Rita M. Potocki and Charles W. Beckett. Dec. 1, 1951. 6p. (NBS-1294; U20678)

Heat-capacity, ΔH, ΔF, and ΔS functions are tabulated in dimensionless units for monatomic F in the ideal gas state between 50 and 5000°K. Reliability of the data depends primarily on the accuracy of the physical constants taken from Lundell (J. Am. Chem. Soc. 70, 3531(1948)) and Wagman (J. Research Natl. Bur. Standards 34, 143(1945)) and the energy levels obtained from Moore (NBS circular 467, 1949). The estimated uncertainty is less than 0.1%. (NRS abst.)

2029

Naval Research Lab.

INFRARED SPECTRA OF FLUORINATED HYDROCARBONS, by D. C. Smith, Morris Alpert, R. A. Saunders, George M. Brown and Norma B. Moran. Feb. 1. 1952. 100p. (NRL-3924)

New infrared data for fifty-five compounds have been obtained with prism spectrometers covering the 2-38 micron range. For fourteen compounds (CF_2 = CHCl, fluorobenzene, and twelve ethane derivatives), fundamental frequency assignments have been made, and interpretations have been presented for nearly all bands in the infrared and available Raman spectra. Thermodynamic functions have also been computed for eight of the ethane derivatives. (NRL abst.)

2030

THE DENSITY OF LIQUID FLUORINE. Scott B. Kilner, Carl L. Randolph, Jr., and Rollin W. Gillespie. J. Am. Chem. Soc. 74, 1086-7(1952) Feb. 20.

The density of liquid F_2 at −196°C has been determined with a Pyrex hydrometer to be 1.54 ± 0.02 g/cc. This indicates that the result of Kanda (Bull. Chem. Soc. Japan 12, 469, 473(1937)) of 1.13 g/cc is about 27% in error.

2031

ORGANIC FLUORIDES. PART XI. FLUORINATION OF HETEROCYLIC COMPOUNDS WITH COBALT TRIFLUORIDE. R. Montgomery and F. Smith. J. Chem. Soc., 258-9 (1952) Jan.

Fluorination of thionaphthene in the vapor phase with CoF_3 led to complete elimination of the S. On perfluorination with UF_6, the principal product, perfluoroethylcyclohexane, was accompanied by a small amount of perfluorocyclohexane and a high-boiling polymeric material. Fluorination of 2-methylindole with CoF_3 followed by UF_6 led to a complicated mixture of products, 11 fractions being separated by distillation. Perfluorocyclohexane and perfluoromethylcyclohexane were identified tentatively. The N showed some stability to CoF_3.

2032

THE SPECTRA OF FLAMES SUPPORTED BY FLUORINE. R. A. Durie. Proc. Roy. Soc. (London) 211A, 110-21(1952) Feb. 7.

Part I. Flames with organic substances. F_2 reacts with most organic substances, the reaction being accompanied by a flame. The spectra of several of these flames are described. The hydrocarbon/F flames emit C_2 and CH bands. The organic halide/F flames emit a yellow-green continuum, but the gradual addition of H_2 causes first heavy carbon formation, which then decreases as C_2 bands, then CH, begin to appear until, finally, only C_2 and CH bands are emitted. The 4050-A comet-head group of bands appear in these flames under conditions giving carbon formation and strong C_2 and weak CH. The similarity of the spectra of the hydrocarbon/F and hydrocarbon/O_2 flames and the possible mechanisms for carbon and C_2 and CH formation in these flames are discussed. The possible identity of the emitter of the 4050-A comet-head group is discussed. Part II. Flames with inorganic substances. The reactions of F_2 with many inorganic substances are accompanied by flames. The spectra of the fluorine-supported flames with H_2, S, H_2O, and NH_3 have been studied. S is a persistent impurity in the H_2 flame which proves to be a good source for the SH(0,0) emission band. The H_2O flame emits the O Schumann-Runge bands with unusual appearance due to a low rotational temperature; the vibrational intensity distribution of the Schumann-Runge bands in this source has been studied and is found to agree quite well with the theoretically predicted distribution. The NH_3 flame emits new bands in addition to the NH(0,0) band at 3360 A; these bands are identical with those observed in hydrogen azide explosions, and their assignment to the NH radical is thus supported. (auth)

2033

ON FLOURINE-ACTIVE SUBSTANCES. Hans Bode and Ernst Klesper. Z. anorg. u. allgem. Chem. 267, 97-112 (1951) Dec. (In German)

The action of pure gaseous F_2 on halogenides, especially on KCl, RbCl, and CsCl results in the formation of substances containing more F than the 1:1 stoichiometric ratio. The properties of these substances are described, and the mechanism of formation is discussed. The Rb and Cs compounds approach the formula MeF_3. A discussion of the structure of these compounds does not lead to definite conclusions.

2034

THE DEVELOPMENT OF CRYSTALLINITY IN POLYCHLOROTRIFLUOROETHYLENE. Fraser P. Price. J. Am. Chem. Soc. 74, 311-18(1952) Jan. 20.

Polychlorotrifluoroethylene on cooling from above its first-order transition point (205 to 210°C) develops crystalline regions in the form of spherulites. The development of this crystallinity is accompanied by an increase in dielectric constant and loss, tensile strength, opacity, and density. Spherulites appear only on cooling from above the melting point. Their growth rates are linear with time and depend on the growing temperature and the viscosity of the melt. Between 175 to 190°C the number of spherulites does not increase with time and is determined by the highest temperature above the melting point to which the sheet was heated. Below 175°C the number increases with time. These facts indicate heterogeneous nucleation above 175°C and heterogeneous plus homogeneous nucleation below 175°C. A sheet quenched to room temperature from above its melting point develops evidence of crystallinity only very slowly when heated to 150 to 190°C. This is due to the very slow coalescing of microcrystalline regions to produce the gross effects of crystallinity. Density measurements have been made from 15 to 230°C and thermal

2035

THE IONIZATION CONSTANTS OF SOME FLUORINE-CONTAINING ALCOHOLS. E. T. McBee, W. F. Marzluff, and O. R. Pierce. J. Am. Chem. Soc. 74, 444-6(1952) Jan. 20.

Diols of the general formula $HOCH_2(CF_2)_n CH_2OH$ where n is 1, 2, 3, or 4 were synthesized. The pK_a values of 2,2,3,3-tetrafluoro-1,4-butanediol were measured and found to be 12.1 ± 0.1 and 13.7 ± 0.2 while those of 2,2,3,3,4,4,5,5-octafluoro-1,6-hexanediol were determined as 12.1 ± 0.1 and 12.8 ± 0.2. In addition, the pK_a value of 2,2,2-trifluoroethanol was measured and found to be 12.3 ± 0.05. The inductive effect of fluorine substitution beta to hydroxyl groupings can be calculated by empirical methods. (auth)

GRAPHITE

2036

THE INTERLAYER BINDING IN GRAPHITE. Robert O. Brennan. J. Chem. Phys. 20, 40-8(1952) Jan.

The repulsive energy between layers of the graphite crystal has been calculated as an interaction of LCAO molecular orbitals in the layers. The van der Waals attractive term was found by setting the energy minimum to fall at 3.37A. When values of the effective nuclear charge and effective quantum number proposed by Kohlrausch were used, the interlayer binding energy was found to be 3.99 kcal/mole. The compressibility, calculated under plausible assumptions, is in satisfactory agreement with the experimental value.

LABORATORIES AND EQUIPMENT

2037

Los Alamos Scientific Lab.

EXPLANATION OF CERTAIN DESIGN CRITERIA; CHEMISTRY-METALLURGY RESEARCH BLDG., LOS ALAMOS, NEW MEXICO, by J. B. Graham. [nd] 8p. (AECU-1881; LADC-1106)

The design of the drainage and ventilation systems for the Chemistry-Metallurgy Research building at Los Alamos is described. The laboratory contains one drainage system for handling hot and cold laboratory waste. The drainage system runs to retention tanks which catch all drainage from the building except sanitary sewage. When a tank is full, it is monitored and, if found to be below tolerance, the content is released to the industrial sewer system. If found to be above tolerance, the solution is processed to recover the active material. The ventilation system is designed to eliminate or centralize routine maintenance and still maintain a minimum face velocity of a 100 fpm in the hoods. Each hood is equipped with a by-pass damper which operates by a mechanical linkage to the hood door to compensate for different door positions.

2038

Knolls Atomic Power Lab.

PROGRESS IN VACUUM FUSION ANALYSIS AT KAPL, by W. S. Horton. Jan. 3, 1952. 31p. (KAPL-666)

This report describes the apparatus designed and constructed at KAPL for vacuum fusion analysis. Diagrams show the arrangement and the individual components. The apparatus appears to be unique in the use of glass-mercury solenoid valves instead of stopcocks or U-type mercury cutoffs. The blank rate obtained is as satisfactory as those from other laboratories. The results on National Bureau of Standards samples of "Cooperative Steels" compare favorably with those reported by the cooperators. Some vanadium samples were analyzed and the results made it possible to show that one sample was inhomogeneous. Some data on oxygen recoveries from chromium-chromic oxide mixtures appear to indicate an optimum operating temperature of about 1600°C when molten iron is used as a flux. (auth)

2039

Yale Univ.

EFFECT OF GAMMA RADIATION ON CHEMICAL REACTIONS. I. INSTALLATION OF COBALT-60 RADIATION SOURCE; PROGRESS REPORT NO. 1 (FOURTH QUARTER, 1951). Randolph H. Bretton, Director. Jan. 20, 1952. 10p. (NYO-3307; Progress Report No. 1)

The radiation-induced vapor-phase polymerization of acetylene and ethylene is to be investigated. A kilocurie Co^{60} γ-radiation source has been received from Brookhaven National Laboratory and installed. The pig containing the source is supported on a base 17 in. high and is enclosed by a concrete wall 8 in. thick and 5 ft high. A pulley system for use in the removal of the plug has been constructed. A survey of the radiation field around the pig has been made. Even though a certain amount of downward scattering and reflection of the high-intensity beam apparently occurs when the beam impacts on the ceiling, no region of excessive intensity was found outside of the confined region designated for the pig installation.

2040

ORGANIZATION AND EQUIPMENT OF A LABORATORY FOR RESEARCH WITH RADIOISOTOPES. A. Di Marco, C. Pasini, and L. Terra. Farm. sci. e tec. (Pavia) 6, 938-48 (1951) Nov.-Dec. (In Italian)

The floor plan, equipment, and instruments of a five-room tracer laboratory constructed at the Laboratori Ricerche Scientifiche Farmitalia S. A., Milan, Italy, are described and illustrated. 5 figures.

2041

ON THE DISTRIBUTION OF RADIOACTIVE RECOIL ATOMS IN VARIOUS RHENIUM SALTS AND ON THE PRODUCTION OF A RADIORHENIUM PREPARATION OF MAXIMUM SPECIFIC ACTIVITY. Wilfrid Herr. Z. Naturforsch. 7b, 55-6(1952) Jan. (In German)

The valence-state distribution of total $Re^{186,188}$ activity following neutron irradiation of various Re compounds has been studied. Separation of lower valence states of the recoil atoms resulting from irradiation of $KRe(VII)O_4$ was not possible, even with strong reducing agents. Both fast- and slow-neutron irradiation of solid $K_2Re(IV)Cl_6$ resulted in ~30% of total activity being found in the VII valence state; in acid solution this increased to 97 to 100%, even in the presence of HI or H_2SO_3. A tracer-free Re* preparation may be obtained by Tetron (N,N′-tetramethyl-o-tolidine) precipitation of Re(IV). Irradiation of $ReCl_3$ crystals led to ~30% of the activity in valence state III, ~4% in IV, and ~66% in VII. In aqueous solution 100% of the activity appeared in the VII state. Separation of the inactive $ReCl_3$ is conveniently performed by shaking with benzonitrile.

RADIATION EFFECTS

2042

Atomic Energy Project, Univ. of Calif., Los Angeles

THE RADIATION CHEMISTRY OF CYSTEINE SOLUTIONS. PART II. a. THE ACTION OF SULFITE ON THE IRRADIATED SOLUTIONS. b. THE EFFECT OF CYSTINE, by S. L. Whitcher, Mary Rotheram and N. R. Todd. Feb. 25, 1952. 15p. (UCLA-185)

When aqueous cysteine solutions are irradiated with x rays in the range 5,000–20,000 r, the amounts of cystine found experimentally agree fairly well with those calculated from the decrease in cysteine concentration. With further exposure the calculated values become larger than the experimental and the difference gets progressively greater as the dose increases. The results indicate that disulfide is formed as the first product and with continuing exposure it is itself attacked. This is confirmed by irradiation experiments on solutions of cystine during which a part of it is destroyed and hydrogen peroxide formed in the solution. There is no reduction to cysteine and no production of hydrogen sulfide; accordingly the attack on the cystine is presumed to be entirely oxidative. The oxidation products could not be identified due to the lack of suitable methods of analysis. (auth)

2043

DIFFERENCE BETWEEN THE RETENTIONS OF NUCLEAR ISOMERS OF Br^{80} FOLLOWING RADIATIVE CAPUTRE OF THERMAL AND RESONANCE NEUTRONS. P. C. Capron and E. Crèvecoeur. J. chim. phys. 49, 29-45(1952) Jan. (In French)

Retention is defined as the ratio of the number of radioactive atoms remaining in the irradiated liquid, after an extraction with H_2O, to the total number of radioactive atoms formed. The retention (r) of the two Br^{80} isomers has been measured following irradiation of C_6H_5Br by Ra-Be neutrons. Source and sample were inserted in a paraffin block with and without direct intervention of a Cd sheet. For a source-liquid distance of 2 cm and slow neutrons (without Cd), r(18-min) = 0.50 ± 0.06 and r(4.4-hr) = 0.65 ± 0.03. The ratio r(18-min)/r(4.4-hr) varied with incident-neutron energy from 0.76 to 0.89 in experiments without Cd and from 0.76 to 1.06 with Cd. These variations imply a difference between the recoil energies of the isomers.

2044

MEASUREMENTS OF THE ELECTRICAL CONDUCTIVITY OF CdS CRYSTALS BY IRRADIATION WITH ELECTRONS OF MODERATE ENERGY. H. Benda. Ann. Physik (6) 9, 413-22(1951). (In German)

The conductivity of CdS crystals irradiated with 800- to 3000-v electrons has been investigated. The currents measured were between 0.001 and 10 μa. As in irradiations with light, the conductivity is related to the excitation intensity by a simple power law, the exponent of which lies between 0.5 and 1. In the region studied, each crystal had a specific exponent. The complex changes in conductivity with electron potential and the quantum yield are discussed.

2045

SOME FREE-RADICAL REACTIONS OF PHENOL; THE ACTION OF THE HYDROGEN PEROXIDE–FERROUS SALT REAGENT AND OF X-RAYS ON AQUEOUS SOLUTIONS OF PHENOL. Gabriel Stein and Joseph Weiss. J. Chem. Soc., 3265-74(1951) Dec.

The action of OH and HO_2 radicals, produced by Fenton's reagent and irradiation with x rays, respectively, on phenol in aqueous solution has been studied as a sequel to that on other benzene derivatives. Only the o- and the p-dihydroxy-derivative are formed, their relative ratios depending on the pH. The mode of action of Fenton's reagent has been reinvestigated, with special reference to the role of the ferric ions in this system. Under certain experimental conditions quinonoid products, and in particular o-benzoquinone, may be formed, apparently without the intermediate formation of quinol or catechol. This quinone obtained in acid solution has been shown to be similar to that obtained by the action of the enzyme tyrosinase on phenol in neutral solutions. Possible reaction mechanisms have been outlined. A method for the determination of small quantities of catechol and quinol, in the presence of a large excess of phenol, and a color reaction for o-benzoquinone, are described. Further experiments on the action of mixed γ ray–neutron radiations on benzene and on phenol under various conditions are reported. (auth)

2046

SOME FREE-RADICAL REACTIONS OF CHLOROBENZENE. THE ACTION OF THE HYDROGEN PEROXIDE–FERROUS SALT REAGENT AND OF X-RAYS ON AQUEOUS SOLUTIONS OF CHLOROBENZENE. G. R. A. Johnson, Gabriel Stein, and Joseph Weiss. J. Chem. Soc., 3275-8(1951) Dec.

The reactions of chlorobenzene in aqueous solution with OH and HO_2 radicals, produced by means of Fenton's reagent and by x rays, have been studied. The three chlorophenols were formed in both cases. Their relative proportions have been estimated, and the dependence of this ratio on the pH investigated. The position occupied by the chlorine atom is also attacked, and dechlorination and formation of diphenyl result. The extent of this reaction is apparently not influenced by pH. The results indicate that the presence of the chlorine substituent in the aromatic ring has an effect similar to that of the nitro- or carboxy-groups (J. Chem. Soc., 2074(1949); 2704(1950); 405(1951)), but different from that of the hydroxyl group. Possible reaction mechanisms are discussed. Separation of the chlorophenols by paper chromatography is described. (auth)

SEPARATION PROCEDURES

2047

Atomic Energy Research Establishment, Harwell, Berks (England)

THE EXTRACTION OF THE URANYL ION BY THIOPHENOYL TRIFLUOROACETONE, by G. N. Walton, F. Barker, and G. Byfleet. Aug. 20, 1951. 31p. (AERE-C/R-768)

The variation of the extractability of the uranyl ion from nitric acid solution by the complexing agent thenoyltrifluoroacetone (TTA) in benzene solution is measured with different acid, TTA, and uranyl ion concentrations, in conditions in which the amount of the complexing agent is comparable to the amount of complexable material. A complex compound containing the uranyl ion is separated and characterized by analysis. The data for the extractability are interpreted in terms of the concentrations and activity coefficients of the species known to be present. The activity of the uranyl ion is reduced in aqueous solution, and the activity of the uranyl complex is reduced in benzene solution, by the presence of TTA. It is further shown how the observed alterations in activities may be expressed in terms of the formation constants of postulated intermediate complexes. Independent evidence obtained from electrometric titrations shows that the formation of an intermediate complex in the aqueous phase does not fully explain the variations in the activity coefficients in the aqueous phase. Solubility data for the uranyl complex in benzene do, however, satisfactorily confirm the variations and magnitude of the activity coefficients of the uranyl complex in the benzene phase as calculated from the extractability. (auth)

2048

Atomic Energy Project, Univ. of Calif., Los Angeles
PREPARATION AND PROPERTIES OF THYMUS NUCLEIC ACID, by Norman S. Simmons, Stella A. Chavos, and H. Kenneth Orbach. Feb. 14, 1952. 24p. (UCLA-184)

A method is described for the simple and rapid preparation of sodium desoxyribonucleate from calf thymus glands in one day at 0° and at a pH near neutrality. Unique use is made of sodium xylene sulfonate as protein precipitant and repeated precipitation of the nucleate is made with isopropyl alcohol in the presence of 0.3 M sodium acetate. Elemental, electrophoretic and ultracentrifugal analyses indicate the resultant product is homogeneous within the limits of these methods. Careful methods of handling for analysis and drying procedures are emphasized. (auth)

2049

ENRICHMENT OF TIN ACTIVITY THROUGH THE SZILARD-CHALMERS SEPARATION. Herta Spano and Milton Kahn. J. Am. Chem. Soc. 74, 568-9(1952) Jan. 20.

Tetraphenyltin is a suitable compound for the enrichment of tin activity through the Szilard-Chalmers reaction. Solid tetraphenyltin was irradiated with slow neutrons, dissolved in benzene, and extracted with various aqueous solutions. The results are summarized as follows:

Expt.	Aqueous solution	Enrichment factor	Sn activity in aqueous phase, %
1	H_2O	113	4
2	3.0 f HCl	2200	40
3	6.0 f HCl	2700	48
4	1.0 f NaOH	2800	50

2050

THE USE OF STARCH CHROMATOGRAPHY AND ION EXCHANGE RESIN FOR LARGE SCALE SEPARATIONS OF N^{15}-LABELED AMINO ACIDS. Stig E. G. Åqvist. Acta Chem. Scand. 5, 1030-45(1951).

All of the common amino acids have been isolated from acid hydrolysates of 25 to 50 g of protein by means of the cation exchange resin Dowex 50 with hydrochloric acid as eluting solvent. Starch chromatography has been employed to separate the same amino acids from hydrolysates of 250 to 300 mg of protein. Both techniques have been used to isolate samples of N^{15}-labeled amino acids, and have been found quite satisfactory for the isolation of materials with the degree of purity required for isotope work. The identity of the amino acids isolated has been proved by means of paper chromatography. The existence of several other unknown substances has been revealed by these separations, and the identity of these substances is discussed.

SPECTROSCOPY

2051

MICROWAVE SPECTRUM AND STRUCTURE OF ReO^3Cl. E. Amble, S. L. Miller, A. L. Schawlow, and C. H. Townes. J. Chem. Phys. 20, 192(1952) Jan.

A number of microwave absorption lines caused by Re trioxychloride have been studied and listed. The ratios of the frequencies of these lines allow their identification as the rotational transitions $J = 2 \rightarrow 3$, $4 \rightarrow 5$, $5 \rightarrow 6$, and $11 \rightarrow 12$. The nature of the spectrum shows that the molecule is a symmetric rotor.

SYNTHESES

2052

Los Alamos Scientific Lab.
MICRO SYNTHESES WITH TRACER ELEMENTS. XXXI. THE SYNTHESIS OF ETHYLENEDIAMINE TETRA-(2-C_4^{14}-Acetic) ACID, by Arthur Murray III and Anthony R. Ronzio. [nd] Decl. Feb. 25, 1952. 7p. (AECD-3319;LADC-1107)

Ethylenediamine tetracetic acid (versene) was synthesized by reaction of C^{14}-labeled formaldehyde with a solution of ethylenediamine, H_2O, NaOH, and NaCN. The ethylenediamine was carboxymethylated with slightly over one equivalent of formaldehyde in the cold, then hydrolyzed under conditions of reflux. Ammonia was removed and the volume of solution was kept small during further addition of formaldehyde by active distillation of the solution. An average yield of 76.6% was obtained.

2053

Los Alamos Scientific Lab.
MICRO SYNTHESES WITH TRACER ELEMENTS. XXIX. THE SYNTHESIS OF 1,2-DIHYDROXYANTHRAQUINONE-9-C^{14}, by D. Lloyd Williams and Anthony R. Ronzio. [nd] 25p. (AECU-1880; LADC-1082)

Alizarin (1,2-dihydroxyanthraquinone) labeled with C^{14} was prepared by the following series of reactions: 2-Bromobenzoic acid prepared by permanganate oxidation of 2-bromotoluene was treated with an excess of thionyl chloride to give 2-bromobenzoyl chloride. Reaction of this product with phenol gave phenyl 2-bromobenzoate which in turn reacted with $AlCl_3$ to give 2-bromo-4-hydroxybenzophenone. Reduction of this with Zn amalgam and HCl gave 2-bromo-4-hydroxydiphenylmethane which was converted to its 2-tetrahydropyranyl ether by mixing with dihydropyran. C^{14} was introduced at this point by carbonation (with $C^{14}O_2$) of a mixture of butyllithium and 2-bromo-4-hydroxyphenylmethane 2-tetrahydropyranyl ether. The 2-(4-hydroxybenzyl)-benzenecarboxylic-C^{14} acid resulting from the carbonation was treated with HF to give 2-hydroxy-9-anthrone-9-C^{14} which was oxidized to 2-hydroxyanthraquinone-9-C^{14} with sodium dichromate dihydrate in acetic acid solution. Heating of this product with NaOH and $KClO_3$ gave the C^{14}-labeled alizarin in about 65.4% yield (based on $BaC^{14}O_3$).

2054

Los Alamos Scientific Lab.
MICRO SYNTHESES WITH TRACER ELEMENTS. XXX. THE SYNTHESIS OF PENTAMETHYLENETETRAZOLE (METRAZOLE) LABELED WITH C^{14}, by Arthur Murray III and Anthony R. Ronzio. [nd] 4p. (AECU-1882; LADC-1087)

Pentamethylenetetrazole (metrazole) was synthesized by reacting hydrazoic acid with cyclohexanone-2-C^{14}. After extraction and sublimation of the product, the yield was 73 to 90.5%.

2055

THE PREPARATION OF C^{14}-CHAIN LABELED CHOLINE CHLORIDE. William G. Dauben and Mildred Gee. J. Am. Chem. Soc. 74, 1078-9(1952) Feb. 20.

Choline labeled with C^{14} in the chain is desirable in phospholipid and metabolism studies. A method of synthesis starting with acetic acid and allowing specific labeling of individual C atoms was developed. Carboxyl-labeled Na acetate was converted into chloroacetic acid in the standard fashion, and this acid was esterified with diazoethane. The resulting ethyl chloroacetate was then allowed to react with dimethylamine, and the product was reduced to N,N-dimethylaminoethanol with $LiAlH_4$. The substituted ethanol was further methylated with methyl iodide, and the choline iodide so formed was converted into choline chloride.

2056

SYNTHESIS OF RADIOACTIVE CORTISONE. David K. Fukushima, Theodore H. Kritchevsky, Maxwell Leigh Eidinoff, and T. F. Gallagher. J. Am. Chem. Soc. 74, 487-90(1952) Jan. 20.

The synthesis of radioactive cortisone has been described. The platinum catalyzed exchange of T for H was accomplished with 3 α-acetoxypregnane-3,20-dione and cortisone acetate was prepared from this compound. The distribution of the isotope in the molecule was studied and the majority of the isotope was localized at C-16. (auth)

TRACER APPLICATIONS

2057

Radiation Lab., Univ. of Calif.

THE PATH OF CARBON IN PHOTOSYNTHESIS, IV. RIBULOSE AND SEDOHEPTULOSE, by A. A. Benson, J. A. Bassham, M. Calvin, A. G. Hall, H. Hirsch, S. Kawaguchi, V. Lynch, and N. E. Tolbert. Jan. 1952. 25p. (UCRL-1609)

Sedoheptulose and ribulose phosphates have been identified in a varied group of photosynthetic organism. These phosphates are among the earliest sugar phosphates formed during photosynthesis. The biosynthetic relationships of sedoheptulose and ribulose are discussed. It is proposed that they are not directly involved in hexose synthesis but may serve as sources of C_2-carbon dioxide acceptors required during photo-synthesis. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

2058

THE TRANSURANIUM ELEMENTS. William Q. Hull. Chem. Eng. News 30, 232-37(1952) Jan. 21.

A review is presented of the discovery and formation of the transuranic elements and their isotopes.

2059

THE MISSING HEAVY ELEMENTS. N. K. Saha and Jagdish Verma. Indian J. Phys. 25, 409-16(1951) Sept.

The possible causes of the absence of elements with $Z \rightarrow 92$ and of isotopes of the $4n + 1$ series in nature are considered. A plot of the Heisenberg energy surfaces for the observed α-emitting nuclei reveals the probable existence of an energy-high in the region of lower isotopes of U, Np, and Pu. Natural extinction of these isotopes by short-life α decay is, therefore, considered possible. The mean life of spontaneous fission of heavy isotopes is calculated from Turner's extension of Bohr and Wheeler's theory of nuclear fission. The results show that Am and higher elements would have a mean fission life too short to survive in nature. The processes of production of the higher isotopes of Np and Pu in the laboratory are compared with the natural processes of formation of heavy elements in the interior of dense stars. The heavy elements are probably formed in the stellar processes in very high states of excitation favorable for spontaneous fission. The same reason makes it possible that the nuclear reactions which lead to the formation of $4n + 1$ nuclei cannot take place in the stellar processes on account of serious competition from spontaneous fission processes of the highly excited heavy nuclei formed in these processes.

URANIUM AND URANIUM COMPOUNDS

2060

Carbide and Carbon Chemical Co. (K-25)

CRITICAL TEMPERATURE AND PRESSURE OF URANIUM HEXAFLUORIDE, by G. D. Oliver, J. W. Grisard, and H. T. Milton. [nd] Decl. Feb. 26, 1952. 2p. (AECD-3318)

Several values for the critical temperature and pressure of uranium hexafluoride which have been estimated from related physical properties are found in the literature. Since these values vary as much as 30° and 20 atm., respectively, it was considered desirable to publish experimental values for these constants. An ebulliometric method of measuring vapor pressure has been employed to measure the high vapor pressure of uranium hexafluoride, from which its critical temperature and pressure have been determined. Briefly, the apparatus consisted of two monel boiling point tubes connected through traps to a common pressure system containing helium as a buffer. The boiling temperature of uranium hexafluoride in one tube was compared directly with the boiling temperature of water in the other. A platinum resistance thermometer, and G-2 Mueller bridge and galvanometer were used to measure the temperatures. The pressure corresponding to the observed boiling point of the water was obtained from steam tables. When these pressure and temperature data were plotted, P vs. t, the slope of the resulting line increased rapidly in the critical region. As previously found in experiments on water, changes in pressure above the critical did not change the temperature. A critical temperature of $230.2 \pm 0.2°C$ and a critical pressure of 45.5 ± 0.5 atm. were estimated from the plotted data at the point where the slope, dp/dt, approaches infinity. Critical temperature and pressure values determined by this method for water and hexadecafluoroheptane check the published values determined by other methods. (Entire Report)

2061

Los Alamos Scientific Lab.

THE HEATS OF COMBUSTION OF THROIUM AND URANIUM, by Elmer J. Huber, Jr., Charles E. Holley, Jr., and E. H. Meierkord. [nd] 12p. (AECU-1294(Rev.); LADC-960(Rev.))

Precise measurements of the heats of combustion of Th, U, and U dioxide have been made and, from the results, the heats of formation of ThO_2, UO_2, and U_3O_8 have been calculated. The final values for the various materials are listed as follows: Thorium, heat of combustion in 25 atm. oxygen $= 5276 \pm 7$ joules/g, heat of formation of ThO_2, $\Delta H_{25°C} = -1,227.4 \pm 1.5$ kjoules/mole; Uranium Dioxide, heat of combustion in 25 atm. oxygen $= 389.23 \pm 0.46$ joules/g, heat of the reaction $3UO_2 + O_2 = U_3O_8$, $\Delta H_{25°C} = -318.01 \pm 0.37$ kjoules; Uranium, heat of combustion to U_3O_8 in 25 atm. oxygen $= 4984.7 \pm 9.7$ joules/g, heat of formation of U_3O_8, $\Delta H_{25°C} = -3570.9 \pm 6.9$ kjoules/mole. It was necessary to cut the U into small pieces and mix it with UO_2 in order for it to oxidize completely to U_3O_8. The heat of formation of UO_2 calculated from the above results is $\Delta H_{25°C} = -1,084.3 \pm 2.5$ kjoules/mole. (auth)

2062

ON CERIUM–URANIUM BLUE AND THE SEMICONDUCTIVE PROPERTIES OF THE MIXED-CRYSTAL SERIES UO_2–CeO_2. W. Rüdorff and G. Valet. Z. Naturforsch. 7b, 57(1952) Jan. (In German)

A series of pure UO_2–CeO_2 mixed crystals were prepared by igniting Ce(IV) and U(IV) salts at 1200°C in high vacuum. All these crystals were blue. The specific resistance of UO_2, 5×10^3 ohm-cm, decreased with CeO_2 addition to a minimum of 2.5×10^2 ohm-cm at 40 mole % CeO_2. The high conductivity is explained by electron exchange between valence states. A contrast is drawn with the behavior of the brown UO_2-ThO_2 mixed-crystal series.

2063

THE REACTION BETWEEN URANIUM AND OXYGEN. Daniel Cubicciotti. J. Am. Chem. Soc. 74, 1079-81(1952) Jeb. 20.

From 90 to 165°C, U oxidizes in O_2 according to the parabolic law. From 165 to 215°C the oxidation is essentially linear, but above 215°C the oxidation curve is lower than first degree in the weight of O_2 consumed. This behavior is similar to that of Th and substantiates to some extent the film-cracking hypothesis of oxidation.

ENGINEERING

2064

Brookhaven National Lab.
TENTATIVE SPECIFICATION FOR WASTE HEAT STEAM BOILER, by C. Williams. Aug. 1, 1949. Decl. Jan. 4, 1950. 8p. (AECD-3322)

2065

Oak Ridge National Lab., Y-12 Area
THERMODYNAMIC PROPERTIES OF STEAM AT VERY HIGH PRESSURE; EXTRAPOLATION OF PUBLISHED DATA, by David H. Fax. Aug. 2, 1950. 13p. (TAB-78)

HEAT TRANSFER AND FLUID FLOW

2066

Institute of Engineering Research, Univ. of Calif.
HEAT TRANSFER TO MOLTEN LEAD-BISMUTH EUTECTIC IN TURBULENT PIPE FLOW; 1 JULY 1951 TO 1 FEBRUARY 1952 (Interim Report), by H. A. Johnson, J. P. Hartnett, and W. J. Clabaugh. Feb. 1, 1952. 14p. (AECU-1888)

The heat transfer results which were presented in the previous report were extended to the lower Peclet modulus range of 200-700, where they continue to be 25% below the Lyon-Martinelli momentum prediction. A slight decrease in heat transfer performance was indicated after the system internal atmosphere (i.e. seal gas) was changed from He to N. Further tests are necessary, however, before a definite conclusion is justified. The thermal entry length appears to be approximately 30 diameters over the range of these tests. However, it is noted that the local ratio, h_L/h, for the first three thermocouple positions increases with increasing Reynolds modulus but shows no such trend with the Prandtl modulus. (auth)

2067

Lewis Flight Propulsion Lab., NACA
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF FULLY DEVELOPED TURBULENT FLOW OF AIR IN A SMOOTH TUBE WITH HEAT TRANSFER WITH VARIABLE FLUID PROPERTIES, by R. G. Deissler and C. S. Eian. Feb. 1952. 43p. (NACA-TN-2629)

A previous analysis of turbulent flow and heat transfer in smooth tubes with variable fluid properties was modified in order to be applicable to air which has a Prandtl number slightly less than unity (0.73). In order to verify the analysis, tests were conducted to determine local heat-transfer coefficients and friction factors for fully developed turbulent flow of air in a smooth electrically heated tube having an inside diameter of 0.87 inch and a length of 87 inches. The tests were conducted at high ratios of wall to fluid bulk temperature. Velocity and temperature profiles were measured for some conditions. The analytically predicted results were found to agree closely with the experimental results. (auth)

2068

Lewis Flight Propulsion Lab., NACA
AN ANALYSIS OF LAMINAR FREE-CONVECTION FLOW AND HEAT TRANSFER ABOUT A FLAT PLATE PARALLEL TO THE DIRECTION OF THE GENERATING BODY FORCE, by Simon Ostrach. Feb. 1952. 47p. (NACA-TN-2635)

A formal and general analysis of the free-convection flow about a flat plate parallel to the direction of the generating body force is made, and velocity and temperature distributions for Prandtl numbers of 0.01, 0.72, 0.733, 1, 2, 10, 100, 1000, and large Grashof numbers are computed. The distributions for Prandtl number of 0.72 compare favorably with experimental values. It is shown that velocities and Nusselt numbers of the same order of magnitude as those associated with forced-convection flows can be obtained under free-convection conditions. A flow and a heat-transfer parameter are derived from which the important physical quantities can be computed. Reasonable agreement is obtained among values of the heat-transfer parameter obtained from an approximate theoretical development, experiments, and the present development. (NACA Abst.)

2069

APPROXIMATE SOLUTION OF A TRANSIENT HEAT FLOW PROBLEM. J. H. Blackwell and A. D. Misener. Proc. Phys. Soc. (London) 64A, 1132-3(1951) Dec. 1.

The theoretical solution of a geophysical heat conduction problem has been obtained by approximate operational methods. The problem is that of measuring the thermal constants of an infinite medium of low conductivity by the following method. A thermal 'probe' is inserted into the medium containing a source of heat and some form of thermometer, and a record obtained of temperature within the 'probe' versus elapsed time. The thermal constants are to be evaluated from this record. The problem, basically, is that of solving the heat equation for an infinite region bounded internally by a (hollow) circular cylinder with the standard contact resistance boundary condition at the probe surface, i.e., $-K_2\partial\theta_2/\partial\rho = H(\theta_1 - \theta_2)$ and zero initial temperature. The differential equation and boundary conditions have been subjected to the Laplace transformation and large and small time approximate solutions obtained for a number of probe arrangements.

2070

ON A SIMPLE CORRESPONDENCE BETWEEN THE SOLUTIONS OF TWO PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATION TO THE APPROXIMATE STUDY OF SUPERSONIC FLOW. Paul Germain and Maurice Fenain. Compt. rend. 234, 592-4(1952) Feb. 4. (In French)

A correspondence which permits reduction of a two-parameter equation to the Tricomi equation is derived. The mixed-type equation is for the flow of a fictitious gas, the law of compression of which approximates that of a real gas over a wide velocity range including the velocity of sound.

2071

STATISTICAL THEORY OF NONHOMOGENEOUS TURBULENCE. II. J. Rotta. Z. Physik 131, 51-77(1951). (In German)

A differential equation for the mean dimensions of the turbulence element is derived from the Navier-Stokes equation of motion. Such a relation completes the search for a solvable system of differential equations from which the properties of turbulent flow may be calculated directly. Application to perfect streaming between parallel walls and comparison with experimental results indicates that the mechanism of turbulence is qualitatively comprehensible.

2072

ON THE TWO REGIONS OF FLOW AFTER A FORKED COLLISION. W. Kofink. Ann. Physik (6) 9, 401-5(1951). (In German)

Algebraic expressions are derived for the velocity and density ratios and entropy difference between the two streams resulting from the collision of plane stationary supersonic waves at a forked junction (gabelstoss).

MINERALOGY, METALLURGY, AND CERAMICS

2073

Massachusetts Inst. of Tech.

THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS; Progress Report. Jan. 31, 1952. 51p. (NYO-880; MITS-14)

Mineral engineering problems involving flotation theory, mineral recovery and geochemical research are under investigation. Flotation research has shown that the adsorption of dodecylamine acetate on hematite is governed by an adsorption isotherm bearing remarkable similarities to the isotherm for that same reagent on quartz. Other work on sphalerite includes the measurement of the distribution of hexyl mercaptan between liquid and gaseous phases as a preliminary step to a three-phase measurement including sphalerite as the solid. The dissociation constant of hexyl mercaptan calculated from radiotracer results checks that from conventional chemical methods thus giving credence to the tracer method which is required for certain phases of the work. The activation of sphalerite has been investigated further by the use of radiocopper. Although adsorbed copper cannot be removed with a water wash, the adsorbed copper ions will exchange with copper in solution. Results on the adsorption of xanthate on pyrite from solutions of low concentration (1 and 10 mg/l) as a function of pH are reported. Zeta potential measurements of quartz in solutions of 0-981 mg/l of dodecylammonium acetate have been determined as part of a study of this aspect of flotation. The unsaturated fatty acids, typified by oleic acid, have been found to be nonreactive with dissolved atmospheric oxygen in flotation systems. This conclusion is based on iodine values as determined chemically, and on the interpretation of infra-red transmission curves. (auth)

CERAMICS AND REFRACTORIES

2074

Massachusetts Inst. of Tech.

SOLUBILITY RELATIONSHIPS IN SOME OF THE TERNARY SYSTEMS OF REFRACTORY MONOCARBIDES, by John T. Norton and A. L. Mowry. April 20, 1951. 12p. (NP-3163; Technical Report No. 3)

This material appeared in J. Metals (N. Y.) 3, 923-5(1951) and was abstracted in Nuclear Science Abstracts as NSA 5-6214.

2075

DIELECTRIC PROPERTIES OF COMPOUNDS OF PEROVSKITE TYPE. H. Gränicher. Helv. Phys. Acta 24, 619-22 (1951) Dec. 31. (In German)

The dielectric constant and its temperature coefficient at 20°C have been determined for $SrTiO_3$, $CaTiO_3$, $BaZrO_3$, $LaScO_3$, $NdScO_3$, and $NdAlO_3$, all of which have regular or deformed perovskite structure, and for $CaCeO_3$, CeO_2, and Y_2O_3. For the perovskites, a dielectric constant greater than 35 or 40 is coupled with a negative coefficient; the correlation is positive. Below a constant of ~35, the coefficient is positive and becomes increasingly positive with decreasing dielectric constant. This rule does not hold for the nonperovskite structures. A break was noted in the reciprocal dielectric-constant curve of $CaTiO_3$ at -50°C, although no change was found on x-ray powder diagrams.

CORROSION

2076

STRUCTURE AND CORROSION. G. V. Akimov. Izvest. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk, 469-80(1951) Sept.-Oct. (In Russian)

The different types of corrosive attack are discussed and illustrated with microphotographs and tabulated corrosion rates of the following metals and alloys in various salt, acid, and H_2O_2 solutions: Al, Al-1% Fe, Cu, Cu-0.5% Au, Cd, Cd-0.5% Cu, Pb, Pb-0.5% Ag, Zn, Zn-1% Fe, 99.993% Fe, cast iron, Armco iron, and duralumin.

GEOLOGY AND MINERALOGY

2077

HOW TO MAKE URANIUM MINING PAY MORE. Alvin W. Knoerr. Eng. Mining J. 153, 72-81(1952) Jan.

Case histories of operation and development of several U mines on the Colorado Plateau are presented. The kinds of mining now in progress in the area are surveyed, and specific suggestions are made as to how to mine more cheaply and to produce a better grade of ore. Opinions of several operators concerning necessary equipment are included. Operating details on the Radium Group of mines near Dove Creek are described for the following: open-pit mine, trackless mining, and track-type mining. Other mines discussed are U. S. Vanadium Co.'s Mill No. 2, Climax Uranium Co's operation on Outlaw Mesa, and the Hummer Mine of U. S. Vanadium Co.

2078

ON THE ORDER-DISORDER TRANSITION IN THE CRYSTALLINE LATTICE OF RADIOACTIVE MINERALS. Paul Pellas. Compt. rend. 234, 538-40(1952) Jan. 28. (In French)

In a recent note (Compt. rend. 233, 1369(1951); cf. NSA 6-1225) the author showed that the order-disorder transition (metamict state) observed in allanite, fergusonite, and thorite occurred under the influence of intense fluxes of α particles and recoil nuclei by the Wigner effect. The mechanism is discussed further, and the author concludes that the condition prerequisite to transition is the existence of partially directed bonds in the mineral lattice.

METALS AND METALLURGY

2079

Battelle Memorial Inst.

GALLIUM IN NUCLEAR REACTORS; CONSIDERATIONS FOR USE AS A PRIMARY COOLANT, by R. I. Jaffee, R. M. Evans, E. A. Fromm, and B. W. Gonser. Aug. 1, 1949. Decl. with deletions Feb. 27, 1952. 44p. (AECD-3317; BMI-T-17)

The chief disadvantages of gallium as a primary coolant for nuclear reactors are its borderline thermal-neutron cross section and its corrosivity to containers at elevated temperatures; the chief advantages of gallium are its low melting point, the further lowering of the melting points and gallium content by the use of Ga-Sn-Zn alloys, and the ability of tungsten to contain gallium at temperatures up to 1500°F. This latter advantage actually may be classified as a disadvantage, since tungsten can be processed into forms other than rod and wire only with excessive difficulty, and is heavy, expensive, and has a high thermal-neutron absorption cross section. Weighing advantages against disadvantages, it has been concluded that gallium and gallium-rich alloys are unsuitable as primary coolants for nuclear reactors.

2080

Massachusetts Inst. of Tech.

INDUCTIVE MELTING OF REACTIVE METALS WITHOUT REFRACTORY CONTAINERS, by T. T. Magel, P. A. Kulin. and A. R. Kaufmann. Jan. 1952. Decl. with deletions Feb. 11, 1952. 13p. (AECD-3320; MIT-1080)

Two methods of induction melting without refractory crucibles have been developed. The drip-melting method is useful for melting and alloying without contamination. The process consists of feeding a vertical bar of material to be melted into an induction coil in such a way that the end is melted off continuously and the drops are collected below in a mold. The auto crucible method consists of holding a pancake-shaped induction coil near the flat surface of a horizontal block of the metal to be melted. With this arrangement, the eddy currents are most intense directly under the coil and hence the liquid is pushed toward the center where it builds up in a mound. Diagrams of the apparatus are shown.

2081

Massachusetts Inst. of Tech.

VACUUM REDUCTION OF SOME METALLIC OXIDES USING ZIRCONIUM, by T. T. Magel. Jan. 1952. Decl. with deletions Feb. 11, 1952. 15p. (AECD-3321; MIT-1081)

Several of the more electropositive metals have been prepared by high temperature vacuum reduction of their oxides with zirconium. The method is especially suitable for milligram or gram-scale preparations and has been used to prepare 77 mg of radioactive Be^7 from Be^7O. Attention is again called to the possible hazardous nature of the zirconium reduction of compounds other than oxides, especially sulfates of the alkali metals. (auth)

2082

Battelle Memorial Inst.

THE VANADIUM-URANIUM CONSTITUTIONAL DIAGRAM, by H. A. Saller and F. A. Rough. Dec. 15, 1951. Decl. with deletions Mar. 5, 1952. 17p. (AECD-3323; BMI-716)

Vanadium-uranium equilibrium studies were made on alloys prepared from high-purity vanadium and good biscuit uranium. No intermetallic phases occur in the system. Additions of vanadium lower the uranium melting point and transformations producing a eutectic at 1240 ± 5C and eutectoid reactions at 727 ± 5 and 652 ± 5C. The maximum solubility of uranium in vanadium is about 4 atomic per cent (15 weight per cent). (auth)

2083

Knolls Atomic Power Lab.

NOTE ON THE STRAIN AGING OF IRON SINGLE CRYSTALS, by A. N. Holden and F. W. Kunz. [nd] 5p. (AECU-1895)

Tensile tests on single crystals of high-purity Fe in the form of wires containing 0.005% C, were performed on a rigid, screw-type machine. Results indicated that the crystals had very small initial yield points but were susceptible to strain aging and showed marked yield point effects after straining and aging for a short time at room temperature. The crystals were suspended by 6-inch-long 0.025-in. piano wire. This method of suspension gave an erroneous impression of the elastic behavior of crystals but was satisfactory for yielding studies. A description is given of the results of the tests.

2084

Knolls Atomic Power Lab.

PRECISION EQUIPMENT FOR METALLURGICAL ANALYSES, by L. L. Wyman. Issued June 1950. Re-issued Jan. 1952. 153p. (KAPL-663)

A general discussion of the requirements of equipment suitable for metallurgical research is followed by details of design, construction, and operation of the precision dilatometer, the dial gage dilatometer, the thermo-resistivity unit, and the thermo-critical point unit. The accessory equipment necessary for the operation of each of the above named instruments is also discussed.

2085

Notre Dame Univ.

SURVEY OF THE CHROMIUM-COBALT-NICKEL PHASE DIAGRAM AT 1200°C, by W. D. Manly and Paul A. Beck. Feb. 1952. 45p. (NACA-TN-2602)

A survey of the Cr-Co-Ni ternary phase diagram at 1200°C was made by means of microscopic and x-ray diffraction studies on 110 vacuum melted alloys prepared from commercial metals of the highest purity available. At 1200°C, the following phases occur: (1) very extensive face centered cubic solid solutions, based on the binary Co-Ni solid solutions; (2) body-centered cubic Cr-base solid solutions; and (3) brittle sigma solid solutions, based on the Cr-Co sigma phase which is isomorphous with the Fe-Cr sigma phase. (NACA abst.)

2086

Notre Dame Univ.

SURVEY OF PORTIONS OF THE COBALT-CHROMIUM-IRON-NICKEL QUATERNARY SYSTEM, by E. L. Kamen and Paul A. Beck. Feb. 1952. 62p. (NACA-TN-2603)

An isothermal survey was made of certain portions of the chromium-cobalt-nickel-iron quaternary system at 1200°C. The iron content was varied up to 30 percent to include the range of commercial chromium-cobalt-nickel alloys. The component cobalt-chromium-iron ternary system was also studied. (auth)

2087

Battelle Memorial Inst.

FATIGUE STRENGTHS OF AIRCRAFT MATERIALS; AXIAL-LOAD FATIGUE TESTS ON NOTCHED SHEET SPECIMENS OF 24S-T3 AND 75S-T6 ALUMINUM ALLOYS AND OF SAE 4130 STEEL WITH STRESS-CONCENTRATION FACTOR OF 1.5, by H. J. Grover, W. S. Hyler, and L. R. Jackson. Feb. 1952. 22p. (NACA-TN-2639)

Results are given of axial-load fatigue tests on notched specimens of 24S-T3 and 75S-T6 aluminum alloys and of normalized SAE 4130 steel. Each specimen was notched by edge notches designed to have a theoretical stress-concentration factor of 1.5. Tests were run at nominal mean stresses of 0, 10,000, 20,000, and 30,000 psi. Results extend previously reported data on unnotched specimens and specimens more severly notched afford data on the variation of fatigue strength reduction with notch severity.

2088

Columbia Univ.

QUARTERLY PROGRESS REPORT; THERMODYNAMIC PROPERTIES OF SODIUM VAPOR, by W. A. Selke, Herman Krinsky, and Carl Muendel. Oct. 1, 1951. (NYO-3096)

Using data from the literature, an incomplete temperature-entropy diagram was prepared for sodium vapor in the mixed phase and superheated region from 900 to 1600°K. This diagram differs from the previous ones principally because the entropy of dimerization was included in the calculations. Work has started on construction of apparatus of experimental determination of properties, including vapor pressure, degree of dimerization, and apparent heat capacity at constant pressure. (auth)

2089

Technical Information Service, AEC

ZIRCONIUM; A BIBLIOGRAPHY OF UNCLASSIFIED LIT-

ERATURE, Hugh E. Voress and Fred E. Croxton, comps. Mar. 1952. (TID-3010)

This bibliography contains 1131 references to unclassified research on Zr. It includes information on Zr chemistry, metallurgy, physics, biology, ceramics, and refractories. The references were obtained from standard sources and afford a listing of papers published from 1948 up to about Dec. 1, 1951, with a few earlier references. There are author, subject, and numerical indexes and a listing of abbreviations used for the periodicals to which the references are made. (auth)

2090

X-RAY INVESTIGATION OF THE AGING OF ALUMINUM-7% MAGNESIUM ALLOY. Adrienne-R. Weill. Compt. rend. 234, 523-5(1952) Jan. 28. (In French)

Annealing of a commercial Al alloy containing 6.36% Mg, 0.31% Mn, 0.38% Fe, and 0.14% Si has been followed at 55°C for 4400 hr by an x-ray-diffraction technique. Preliminary tempering consisted in heating at 160°C for 20 hr or at 250°C for 2 hr. The state of lattice tension is related to the appearance of Mg-rich precipitates. A discussion by Pierre Chevenard concerning the experiment is appended.

2091

THE CLADDING OF METALS. R. D. Weber. Metallurgia 45, 3-6(1952) Jan.

A brief discussion of the principles of metal cladding and an outline of methods and processes used is given. Particular attention is given to the techniques of solid phase bonding. References are also given to liquid-phase cladding by means of continuous casting, and to scrap recovery of clad metal.

2092

INVESTIGATION OF DEFORMED ALUMINUM CRYSTALS WITH THE ELECTRON MICROSCOPE. M. V. Yakutovich, E. S. Yakovleva, R. M. Lerinman, and N. N. Buĭnov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 15, 383-6(1951) May-June. (In Russian)

Electron-microphotographs illustrating the structural changes resulting from 4, 20, and 40% deformation of Al single crystals at various temperatures are presented, and the deformation mechanism is discussed.

2093

INVESTIGATION OF INITIAL STAGES OF AGING IN ALUMINUM-BASE ALLOYS. N. N. Buĭnov and R. M. Lerinman. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 15, 358-65(1951) May-June. (In Russian)

Electron-microphotographs of Al-4% Cu, Al-10% Ag, and Al-1.4% Mg_2Si alloys during the initial stages of annealing at various temperatures are presented and discussed. 9 figures.

2094

THE PREPARATION AND PROPERTIES OF TITANIUM-CHROMIUM BINARY ALLOYS. Donald James McPherson, Ph.D. thesis, Ohio State University, 1949-50.

Alloys of Cr and Ti over the entire binary range were prepared by arc melting and by induction melting. Reproducible results could not be obtained on induction-melted alloys because of contamination of melts due to crucible reduction. The arc furnace yielded alloys of 99.5% chemical purity and results were more easily reproducible. The outstanding property of the forgeable Ti-Cr alloys was very high room temperature strength in combination with low specific gravity. The tensile strength of Ti was nearly doubled by the addition of 13 to 18% Cr, with little loss in ductility and only slight increase in weight. The forgeable alloys could not be considered for high temperature use as indicated by oxidation, hot hardness, and preliminary stress-rupture tests.

2095

INFLUENCE OF CARBON ON THE LATTICE PARAMETER OF MOLYBDENUM. Rudolph Speiser, J. W. Spretnak, W. E. Few, and R. M. Parke. J. Metals (N.Y.), 275-7(1952) Mar.

At very low concentrations, carbon dissolves interstitially in molybdenum resulting in a linear expansion of lattice parameter with increase of carbon in solid solution. Geometrical consideration of the relative size of carbon atom to size of interstice approximately predicts the observed volume expansion. (auth)

2096

PREFERRED ORIENTATION OF ARC-CAST MOLYBDENUM SHEET. M. Semchyshen and G. A. Timmons. J. Metals (N.Y.), 279-86(1952) Mar.

The predominant orientation in both straight-rolled and cross-rolled molybdenum is the {100} [110] texture. Upon complete recrystallization, this same texture predominates, but there is less spread about the ideal orientation. A secondary orientation about the [111] direction as the axis develops in cross-rolled sheet. Compression-rolled sheet exhibits random orientation in the plane of the sheet. Some mechanical properties were measured at varying angles to the rolling direction to determine the effect of preferred orientation on anisotropy in molybdenum sheet which had been straight, cross, or compression rolled. (auth)

2097

PROPERTIES OF MAGNESIUM-THORIUM AND MAGNESIUM-THORIUM-CERIUM ALLOYS. T. E. Leontis. J. Metals (N.Y.), 287-94(1952) Mar.

The properties of sand-cast and extruded Mg-Th alloys containing up to 50 wt. % Th have been determined. Thorium increases the strength properties of magnesium over a wide temperature range. These alloys exhibit marked temperature resistance. The most outstanding characteristic of Mg-Th alloys is their high creep resistance at 500 and 600°F. At these temperatures, the creep resistance of Mg-Th alloys is the highest observed in any magnesium alloy to date. One detracting feature of sand-cast Mg-Th alloys is their relatively coarse grain size. The grain size can be effectively reduced by the addition of zirconium with an attendant increase in strength and ductility. (auth)

2098

ZIRCONIUM-CHROMIUM PHASE DIAGRAM. E. T. Hayes, A. H. Roberson, and M. H. Davies. J. Metals (N.Y.), 304-6 (1952) Mar.

An investigation of the equilibrium system of binary alloys of zirconium and chromium in the composition range 0 to 50% Cr was undertaken, but this range was slightly extended to include the intermetallic compound $ZrCr_2$ found to exist at 53 wt. % Cr. The main features of the diagram to be noted are: (1) negligible solubility of chromium in α zirconium, (2) the eutectoid decomposition of β zirconium at 805°C and 1.8% Cr, (3) the maximum solubility of chromium in β zirconium at the eutectic temperature of about 6.2% Cr, (4) the eutectic reaction occurring at 1380°C and 18% Cr, and (5) the existence of an intermetallic compound $ZrCr_2$ (53 wt. % Cr), melting at 1525°C. The compound has a face-centered cubic Cu_2Mg type structure, α_0 = 7.21A. (auth)

2099

NOTE ON THE PREPARATION OF SINGLE CRYSTALS OF METAL. F. Bouillon. Bull. soc. chim. Belges 60, 333-6 (1951) Sept.-Oct. (In French)

A system for reducing at a desired rate the temperature of a furnace surrounding the melt to be crystallized is sketched. The movement of a clockwork mechanism by which the temperature is reduced is controlled by a photoelectric cell on which falls the reflected light beam of a galvanometer. This instrument is connected to a thermocouple measuring the temperature of the melt, and its response is synchronized with the clockwork mechanism. Smooth temperature reduction is achieved.

2100

TIME-TEMPERATURE-TRANSFORMATION CHARACTERISTICS OF TITANIUM-MOLYBDENUM ALLOYS. D. J. Delazaro, M. Hansen, R. E. Riley, and W. Rostoker. J. Metals (N.Y.) 265-69(1952) Mar.

This paper summarizes, on conventional time-temperature-transformation charts, the isothermal transformation products and pertinent reaction rate data for binary alloys of titanium containing 1, 3, 5, 7, 9, and 11% Mo, respectively. The results so presented were derived from metallographic examination. Some x-ray diffraction work was done to clarify certain points in question.

TRACER APPLICATIONS

2101

ON THE THEORY OF NEUTRON WELL LOGGING. Yu. P. Bulashevich. Izvest. Akad. Nauk S.S.S.R. Ser. Geofiz., No. 3, 31-6(1951) May–June. (In Russian; cf. NSA 1-1666)

Theoretical considerations to aid in the use of a thermal-neutron-emitting well-logging device in prospecting for petroleum are presented. Curves are given relating neutron scattering to the characteristics of different oil-bearing rocks and to the dimensions of the sounding instrument.

PHYSICS

2102

St. Louis Univ.

NEUTRON DIFFRACTION STUDY OF THE STRUCTURE OF VITREOUS SiO_2 (FUSED QUARTZ) AND BORON-FREE SODA-LIME-SILICA GLASS, by A. H. Weber. St. Louis Univ. and Argonne National Lab. May 15, 1951. 48p. (AECU-1587)

This report is a brief summary of the results obtained from a neutron-diffraction study of the radial density distribution curve for boron-free soda-lime silica glass and vitreous SiO_2 and from neutron- and x-ray diffraction by crystalline quartz and cristobalite. Results are tabulated.

2103

Knolls Atomic Power Lab.

THE DETERMINATION OF THE ELASTIC CONSTANTS OF METALS BY THE ULTRASONIC PULSE TECHNIQUE, by Myron B. Reynolds. [nd] 28p. (AECU-1894)

The ultrasonic pulse technique offers a convenient means for the measurement of the elastic constants of solid materials. The measurements are nondestructive and, in addition, only one small sample of material suffices for the determination of Young's modulus, the shear modulus, and Poisson's ratio. The use of ultrasonic techniques for measurement of elastic constants is discussed in some detail. The elastic constants of a number of less common metals have been measured by the ultrasonic technique, and for the first time all three constants are reported for each of the following metals: Nb, Ti, Th, and V.

2104

Georgia Inst. of Tech.

STUDIES OF COMPOUNDS FOR SUPERCONDUCTIVITY, by W. T. Ziegler and R. A. Young. Nov. 28, 1951. 37p. (NP-3583; Technical Report No. 3)

Powdered Ti, V, Zr, Ta, and W carbides; Zr, Nb, Ta, W, Mo, Ti, and Th borides; La, Ce, and Nb nitrides; and $LaH_{2.45}$ were examined for superconductivity down to 1.8°K by the magnetic method of Horn and Ziegler (J. Am. Chem. Soc. 69, 2762(1947)). Specimens were characterized by x-ray diffraction and/or chemical analysis. Only NbN showed superconductivity; the range, 14.6 to 16.8°K, agreed with that obtained by Cook, Zemansky, and Boorse (Phys. Rev. 79, 1021(1950)) and others with the electrical resistance or magnetic induction methods. The failure of Ti and V carbides to show superconductivity confirmed the results of Meissner and others (Z. Physik 65, 30(1930) and 75, 521 (1932)), who used an electrical resistance method. Data for Ta and Nb borides were in agreement with those reported by Hulm and Matthias (Phys. Rev. 82, 273(1951)), who used a magnetic method. Particle-size measurements of carbide and boride powders indicated that magnetic field penetration should have no effect on the accuracy of the method if a penetration depth of 1×10^{-5} cm is assumed. A physical distribution of superconducting impurities of undetermined composition was suggested to account for the superconductivity observed in ZrC, TaC, WC, MoB, and ZrB_2 by other investigators. (Presented in part at the Oxford Conference on Low Temperature Physics, Oxford, England, 22-28 August, 1951.) (NRS abst.)

2105

Oak Ridge National Lab.

THE THERMAL CONDUCTIVITY OF MOLYBDENUM OVER THE TEMPERATURE RANGE 1000-2100°F, by Edward P. Mikol. Oak Ridge National Lab. and Alabama Univ., Engineering Experiment Station. Issued Feb. 28, 1952. 11p. (ORNL-1131)

The thermal conductivity of 99.9% pure Mo has been determined over the temperature range 1000 to 2100°F by means of a radial heat-flow apparatus. The data indicate that the variation with temperature is linear in this range. Values of the conductivity at uniform temperature intervals are given. Extrapolation of these data to 32°F gives a value that agrees within 2% with the most probable value given in the International Critical Tables. (auth)

2106

Sylvania Electric Products Inc.

DIMENSIONAL CHANGES NORMAL TO THE DIRECTION OF DIFFUSION, by R. W. Balluffi and B. H. Alexander. Issued Feb. 18, 1952. 21p. (SEP-86)

Measurements were made of dimensional changes normal and parallel to the direction of diffusion of small wires and foils of Au, into which Ag was diffused from the vapor. The linear expansion normal to the diffusion direction was always only slightly less than the expansion parallel to the diffusion stream. The effect is explained by interaction either of interstitial atoms or vacancies with dislocations. This effect is offered as evidence that diffusion in substitutional solutions occurs by way of interstitial atoms or vacancies. (auth)

2107

Radiation Lab., Univ. of Calif.

SUMMARY OF RESEARCH PROGRESS MEETING OF DECEMBER 6, 1951, by S. Shewchuck. Feb. 5, 1952. 7p. (UCRL-1649)

This report includes an abstract of UCRL-1620, High Energy Spallation Products of Zn, by William J. Worthington, Jr., and brief discussions on the production of mesons and protons by neutrons and on a new RCA photomultiplier tube.

2108

THE MELTING PRESSURE OF He^3. B. Weinstock, B. M. Abraham, and D. W. Osborne. Phys. Rev. 85, 158-9(1952) Jan. 1.

The previously reported measurements (Phys. Rev. 82, 263(1951)) on the melting pressure of He^3 between 1.51 and 1.02°K have been extended to 0.16°K. The lower temperatures were obtained by adiabatic demagnetization of ferric ammonium alum, which surrounded the capillary (0.16-mm ID cupro-nickel) containing the He^3. A melting pressure vs. temperature curve is shown. From 0.5 to 1.5°K the data can be represented by the equation $P = 26.8 \pm 13.1T^2$ atm.

Below 0.5°K the experimentally determined pressures rapidly approach a constant value of 29.3 atm. It is clear that the melting pressure at absolute zero is positive, and therefore that the liquid is the stable condensed phase of He^3 at absolute zero.

2109

THERMAL RAYLEIGH DISK MEASUREMENTS IN LIQUID HELIUM II. John R. Pellam and William B. Hanson. Phys. Rev. 85, 216-26(1952) Jan. 15.

The torque exerted by heat flow on a disk suspended in liquid He II has been measured and shown to agree with theoretical values. Such a disk constitutes a direct mechanical detector of the internal fluid convection currents associated with heat current in He II. The agreement between observed torque on the disk and predictions based on the two-fluid theory lend further credence to the internal consistency of that hypothesis. Behavior within various temperature ranges, between 1.2°K and the λ-point, strongly implies that both the normal fluid and superfluid components exert their respective contributions to torque on the disk, as if each fluid individually obeyed the classical König formula. A generalized Bernoulli relationship has been verified throughout the entire liquid He II temperature range down to 1.2°K. In view of the generalized form of this principle it would appear that for the majority of classical hydrodynamical devices and experiments there exists the thermal counterpart in liquid He II. Employed as a calorimeter the thermal Rayleigh disk yields values of specific heat c_v for liquid He II in conformity with values obtained earlier by other investigators using customary methods.

COSMIC RADIATION

2110

NUCLEAR INTERACTIONS OF THE DECAY PRODUCTS OF A NEUTRAL V-PARTICLE. Herbert Bridge, Hans Courant, and Bruno Rossi. Phys. Rev. 85, 159(1952) Jan. 1.

Several decays of V^0 particles have been observed in a large multiple-plate cloud chamber at 10,600 ft. Two views are shown of one event in which both charged secondaries from the V^0 decay interact in one of the 0.25-in. Pb plates, each producing a low-energy star. The mesons produced must be of the π variety, for either . -particle or 3-particle decay, because of cross-section considerations.

2111

THE VARIATION OF INTENSITY OF FAST COSMIC-RAY NEUTRONS WITH ALTITUDE. L. F. Curtiss and P. S. Gill. Phys. Rev. 85, 309-12(1952) Jan. 15.

Using BF_3 proportional counters containing B enriched in B^{10}, imbedded in a paraffin block 15 × 15 × 17 in., as a moderator of fast neutrons, the intensity of such neutrons generated in the atmosphere by cosmic rays has been measured at a number of altitudes between 5000 and 13,000 ft above sea level. These locations were all along the same geomagnetic latitude of 20° 32′ N in Kashmir. The intensity thus measured was found to increase approximately in an exponential manner with decreasing atmospheric pressure under the conditions of the experiments, in general agreement with observations made by other investigators in the free atmosphere, giving an attenuation length in the atmosphere of 128 g/cm². (auth)

2112

ABSENCE OF A DETECTABLE DIURNAL VARIATION IN THE FREQUENCY OF HEAVY PRIMARIES AND NUCLEAR DISINTEGRATIONS AT 80,000 FEET. Gordon W. McClure and Martin A. Pomerantz. Phys. Rev. 84, 1252-3(1951) Dec. 15.

A balloon-borne ionization chamber has been sent aloft at night at Minneapolis in an attempt to detect a possible diurnal fluctuation in the intensity of the burst-producing radiation. The instrument reached 80,000 ft shortly after sundown and dropped rather rapidly after midnight. The night rates recorded at Minneapolis (geomag. lat. 55°N) are compared with the day rates at Swarthmore (52°N). The night counting rates are in excellent agreement with the day rates at all altitudes attained between sunset and sunrise. If a diurnal variation in the burst rate exists at all, its magnitude does not exceed the combined statistical and systematic uncertainties which are estimated as ±5%. Excluding the possibility that the intensities of the heavy nuclei and of the star-producing radiation vary from night to day in opposite senses, it is concluded that the heavy-nucleus intensity does not change by more than ±13%, nor the frequency of stars by more than ±9% from night to day.

2113

IDENTIFICATION OF IONIZING PENETRATING PARTICLES OF MASS INTERMEDIATE BETWEEN THE MASSES OF MESON AND PROTON. V. Kharitonov, G. Marikyan, and A. Alikhanyan. Doklady Akad. Nauk S.S.S.R. 80, 201-4 (1951). (In Russian)

Results of proportional-counter studies on absorption in Pb of cosmic radiation are tabulated. The existence of two types of heavy particles having masses of roughly 600 and 950 m_e is indicated.

2114

OBSERVATIONS ON THE INTERACTIONS OF μ-MESONS UNDERGROUND. E. P. George and P. T. Trent. Proc. Phys. Soc. (London) 64A, 1134-5(1951) Dec. 1. (cf. NSA 5-634)

Observations are reported on the behavior of penetrating cosmic particles traversing large thicknesses of Pb at an underground depth equivalent to 60 m of water. The apparatus consisted of a number of counter trays in coincidence separated by Pb screens of various thicknesses. The cross section for nuclear scatter of μ mesons is deduced as 2×10^{-28} cm²/nucleon. Groups, primarily pairs, of penetrating particles are produced with a cross section having a lower limit of $\sim 4 \times 10^{-29}$ cm²/nucleon. No transition effect was observed when an additional 30 cm of Pb was inserted between the first and second rows of counters.

2115

THE TEMPERATURE EFFECT OF EXTENSIVE AIR SHOWERS. A. L. Hodson. Proc. Phys. Soc. (London) 64A, 1061-4(1951) Dec. 1.

Extensive air showers have been recorded at sea level over a period of nine months. The data show a fairly good correlation between the shower rate and the air temperature at about one cascade unit above the apparatus, e.g. at the 950 mb level. A temperature coefficient of $-0.38 \pm 0.11\%$ per °C at this level is indicated. This may be explained by the dependence of the lateral spread of an extensive shower on the air density. (auth)

2116

TIME AND OTHER VARIATIONS IN THE INTENSITY OF COSMIC RAY NEUTRONS. N. Adams and H. J. J. Braddick. Z. Naturforsch. 6a, 592-8(1951) Nov. (In English)

The barometric coefficient of cosmic-ray neutron production at sea level has been measured to be $-9.25 \pm 0.20\%$/cm Hg. There is no diurnal variation of neutron production of greater amplitude than about 0.4%. The effects of the large solar flare of Nov. 19, 1949, on cosmic-ray neutrons were much greater than on ionizing cosmic rays at sea level; the maximum factor of increase was more than 5, and the intensity remained measurably above normal for about 12 hr. A small increase of neutron intensity is found, statistically, to be correlated with a number of recorded radio fade-outs. It is suggested that neutron measurements are particularly suitable for studying temporal variations of cosmic rays. The latitude increase of cosmic-ray neutrons between geomagnetic latitude 54.5 and 56.5° was found to be about 2%. No certain increase was found between 56.5 and 59.5°. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2117

Indiana Univ.

THE CRYSTAL STRUCTURE OF DIMETHYLGLYOXIME, by Lynne L. Merritt, Jr. and Elma Lanterman. [nd] 20p. (NP-3596; U-20655)

The crystal structure was determined by single-crystal methods as part of the study of factors involved in chelation. The axial lengths were a = 6.10 A, b = 6.30 A, and c = 4.48 A; the real cell angles were $\alpha = 122°31'$, $\beta = 90°6'$, and $\gamma = 79°1'$. The space group was P_1^- - C_1^1, with 1 molecule per unit cell; the crystal was assumed to possess a center of symmetry. Atomic positions were determined by 2-dimensional Fourier refinement, and by further 3-dimensional refinements by the method of least squares. Structure factors were obtained from visually estimated intensities on Weissenberg photographs taken with Cu K_α radiation. The crystal was composed of chains of dimethylglyoxime molecules joined by a network of H bonds. The molecules were essentially planar. The bond lengths were normal except for the central C-C bond, which had a length of 1.44 A. (auth)

2118

DIFFRACTION OF SLOW NEUTRONS BY MICROCRYSTALLINE URANIUM DIOXIDE AND CERIUM DIOXIDE POWDERS. F. Verdaguer, C. Sánchez del Río, R. Keller, and A. Kind. Helv. Phys. Acta 25, 79-86(1952) Feb. 1. (In French)

Measurements of the transmission of monokinetic neutrons by microcrystalline UO_2 and CeO_2 powders, and study of the resulting curves of cross sections as functions of the associated wave length, have resulted in the determination of the value and sign of the U and Ce scattering amplitudes.

2119

STRUCTURAL NEUTRONOGRAPHY. R. P. Ozerov. Uspekhi Fiz. Nauk 45, 481-552(1951) Dec. (In Russian)

The principles of neutron scattering and diffraction and application to the structural determination of solids, liquids, and gases are reviewed at some length. 76 references.

ELECTRICAL DISCHARGE

2120

Radiation Lab., Univ. of Calif.

TRANSFER OF ANODE METAL IN D-C NON-SPARKING DISCHARGES IN HIGH-VACUUM, by Harry G. Heard and Eugene J. Lauer. Jan. 22, 1952. 18p. (UCRL-1622)

Cu^{64} was used as a radioactive tracer to confirm the transfer of anode metal to the cathode in a "non-sparking" d-c discharge in high vacuum. In one run with a 14-mm gap and 100 kv (gradient $\cong 7 \times 10^4$ v/cm) the ratio of transferred copper atoms to electrons was 1:600 for a total drain of 5×10^{-7} amperes. In a different run at 3.5 mm and 50 kv (gradient $\cong 1.4 \times 10^5$ v/cm) the ratio became 1:2 for a total drain of 5×10^{-8} amperes. The relatively large amount of copper transferred suggests that most of the metal crosses the gap uncharged. The current between electrodes was found to be composed of a steady and a randomly fluctuating component. The fluctuating component was found to be independent of pressures but dependent on the total gap voltage and electrode spacing. The fluctuations would, for a set of fixed conditions, usually decrease with time. Tests showed that the fluctuating component of current could not be used to foretell breakdown. (auth)

2121

Oak Ridge National Lab. (Y-12 Area)

A CONTINUOUS SOLUTION OF THE PLASMA-SHEATH EQUATION OF AN ARC, by Raymond Murray and O. G. Harrold, Jr. May 1, 1951. 35p. (Y-756)

A method is presented for deriving the potential distribution in a steady-state discharge of one type described by Tonks and Langmuir (Phys. Rev. 34, 867(1929)). No approximations relating to the neglect of the Laplacian in the space-charge equation or essential neutrality of the plasma are made. It is predicted that the somewhat fewer arc conditions lead to a more pronounced sheath formation than are predicted by the simple theory. In general, the conditions favorable to sheath formation are: low electron temperature, large arc, low ion mobility, and a high ion generation rate. (auth)

ELECTRONS

2122

ENERGY PER ION PAIR FOR ELECTRONS IN GASES AND GAS MIXTURES. J. M. Valentine. Proc. Roy. Soc. (London) 211A, 75-85(1952) Feb. 7.

The energy expenditure per ion pair, V, for electrons in A, He, H_2, N_2, air, O_2 and methane was determined using ion chambers and proportional counters with terminals which correct for "end effect." Experiments using A^{37} and tritium as sources of ionizing electrons were performed. Curves of ion current against percentage of argon admixed with the other gases are plotted. The variation of V with energy of the ionizing electrons was investigated for N_2 between the limits 200 ev and 46.7 kev for the primary electrons and only a small variation was found. The ratio V(gas)/V(argon) is given in each case and is found to be almost identical to the corresponding ratio for ionization by 340-Mev protons. Examination of previous work with α particles suggests close agreement with the values for electrons and protons. (auth)

GASES

2123

Knolls Atomic Power Lab.

THEORY OF BACK DIFFUSION IN SEALS, by Harvey Brooks. Mar. 25, 1949. 14p. (KAPL-671)

The problem of diffusion of a gas in a crack against the flow of another gas is treated by an approximate method. This shows that almost any flow of the second gas will stop diffusion of the first. Certain limitations of the present treatment are pointed out. (auth)

2124

Wisconsin Univ.

THE VIRIAL EQUATION OF STATE, by R. Byron Bird and Ellen L. Spotz. May 10, 1950. 144p. (NP-3616; CM-599; U10999)

The virial equation of state is expressed as a power series in I/V, each term after the first representing deviations from an ideal gas law due to multiple collisions of molecules. The coefficients in this series are functions of temperature and in gas mixtures are given in terms of the coefficients of the component gases. Two fundamentally equivalent approaches to expressing PV in terms of intermolecular forces are set forth in classical and quantum theory. They are the kinetic-theory method and the statistical-thermodynamic method. The validity of the assumptions used are dependent on the range of density and temperature. As very low temperatures are approached the series representation is discarded and contributions from single effects considered. The extension of the theory to diatomic gases has not been satisfactorily completed. A number of models have been assumed for the potential function; the complexity and validity of each vary according to particular applications. The sensitivity to the potential function used becomes noticeable in the third virial coefficients. Numerical evaluation of the coefficients was accomplished with punched-card methods and tables were prepared for evaluation of the second and third virial coefficients and their derivatives. Various thermodynamic relations are stated in terms of these coefficients and derivatives such as enthalpy, correction to internal energy, entropy, specific heats, Joule-Thompson and free-expansion coefficients, the velocity of sound, and Riemann characteristics. Limitations and departures of theory from experiment are discussed. (NRS abst.)

INSTRUMENTS

2125

Los Alamos Scientific Lab.

UNBACKED THIN FILMS, by George A. Sawyer. [nd] 8p. (AECU-1878; LADC-1077)

An abstract of this report was indexed as AECU-1789 and appeared in Nuclear Science Abstracts as NSA 6-955.

2126

Research Lab. of Electronics, Mass. Inst. of Tech.

RESPONSE OF NONLINEAR DEVICES TO A PULSED SIGNAL AND GATED NOISE, by D. B. Armstrong. Oct. 4, 1951. 16p. (NP-3635; Technical Report No. 214; U20879)

The analysis of the performance of nonlinear devices in the presence of signals and noise is extended to the case in which the excitation consists of a pulsed signal and gated noise. The idealized assumption is made that the pulses are rectangular. The general method of analysis (Quart. Applied Math. 5, 445(1947)) involved determining the autocorrelation function of the response of the nonlinear device in terms of the parameters specifying the applied excitation voltage. The magnitude of each line component of the output signal spectrum and the mean power spectrum of the output noise are derived from the output autocorrelation obtained. The general results are applied to a balanced diode phase-detector circuit. (NRS abst.)

2127

Office of Naval Research, London (England)

A MAGNETIC SCALING CIRCUIT, by John K. Beling. Dec. 4, 1951. 13p. (ONRL-124-51; U61511)

A description is given of a scaler in which the storage of pulses is accomplished by a ferromagnetic skin effect. The apparatus is simple in construction and provides a variable scaling ratio. A small modification of the circuit results in a device which will accept the first $n-k$ input pulses without a response and then generate an output pulse for each of the next $k-1$ inputs. An empirical and semiquantitative computation is presented of the magnitude of the positive and negative pulses induced in the secondary. In the present stage of development the resolving time is about 200 μsec.

2128

PLAIN AND BEADED WIRE GEIGER COUNTERS FOR X-RAYS. L. G. Parratt, C. F. Hempstead, and E. L. Jossem. Rev. Sci. Instruments 23, 1-7(1952) Jan.

The calibrations of typical self-quenching plain and beaded wire Geiger counters are studied for measurements of x-ray relative intensities over a range of 1 to 10^5 counts/sec. For plain wire counters, correction for "lost counts" in terms of resolving time is found to be unreliable except at rates less than about 100 counts/sec. The basic difficulty lies in a large and inconstant ratio of spurious to valid counts. This ratio depends upon counting rate, changes in counting rate, tube age, overvoltage, and spread of discharge. Beaded wire counters are studied as an improved type of counter for incident-ionizing events whose primary ionization does not extend along a large fraction of the length of the anode wire. For beaded wire counters, it is believed that corrections reliable to about 2% can be made to the observed counting rate over a rate range of about 1 to 1000 counts/sec if the rate is not abruptly changed at rates above about 100 counts/sec. (auth)

ISOTOPE SEPARATION

2129

Sloane Physics Lab., Yale Univ.

THERMAL DIFFUSION WITH BORON TRIFLUORIDE, by W. W. Watson, J. O. Buchanan and F. K. Elder, Jr. [nd] Decl. Feb. 25, 1947. 9p. (NP-3662)

2130

CONCENTRATION OF N^{15} BY CHEMICAL EXCHANGE REACTION METHOD. Asao Sugimoto, Ryohei Nakane, and Tsunao Watanabe. Bull. Chem. Soc. Japan 24, 153-5(1951) July.

Apparatus used to concentrate N^{15} up to 8 to 9.3 at. % by exchange between NH_3 gas and NH_4^+ ion in packed columns is described briefly.

MASS SPECTROGRAPHY

2131

IONS OF MASS 19 FROM WATER. Francis J. Norton. Phys. Rev. 85, 154(1952) Jan. 1.

It has been found that excess H_2 when present with water yields much H_3O^+ in the mass spectrometer and that the shape of its ionization probability function, as ionizing voltage is changed, is entirely different from the ionization curve for HOD^+. A process is suggested for formation of the H_3O^+ ion. It is possible to distinguish between the ions H_3O^+ and HOD^+ by measuring the ratio of mass 19 positive ion current at 20 volts ionizing potential to that at 70 volts. For H_3O^+ the ratio is 2.0; for HOD^+ the ratio is 0.45.

2132

MOLECULAR LEAK FOR A MASS SPECTROMETER. Guy Nief. J. chim. phys. 49, 49-50(1952) Jan. (In French)

A stable molecular flow has been obtained through a diaphragm consisting of a 0.01-mm-thick Pt foil mounted on a semicapillary pyrex tube and pierced with a hole 5 to 15 μ in diameter. The flow of N_2, H_2, and A through the diaphragm has been measured, and the device has been used as an introduction leak for a mass spectrometer.

MEASURING INSTRUMENTS AND TECHNIQUES

2133

Los Alamos Scientific Lab.

FAST NEUTRON COUNTING WITH HYDROGENOUS LIQUID PHOSPHORS, by G. R. Keepin and R. H. Lovberg. Los Alamos Scientific Lab. and Univ. of Minnesota. [nd] 6p. (AECU-1884; LADC-1054)

The neutron and γ counting efficiencies for five different types of liquid phosphors were investigated for eight different geometrics of specularly and diffusely reflecting liquid containers. Using a Co^{60} source and a 5819 photomultiplier tube, integral bias curves were run for various combinations of liquids and containers; these curves show a straight-line portion when plotted on semilog paper. For different liquids under otherwise identical conditions, variations in the slope of this straight-line portion can be attributed to two parameters characteristic of each liquid; i.e.,

ϵ_c, conversion efficiency or useful light output per unit energy, and k, light absorption coefficient of the liquid in the 5819 useful spectral range. Clearly, variations in ϵ_c and in k are equivalent to variations in over-all system gain which in turn are equivalent to expansion or contraction of the bias voltage scale, and hence also to the measured slope of the linear portion of the integral bias curve. Such curves were obtained for the five liquids in the D-1 container. The measured half-voltage (bias voltage interval in which counting rate is halved) provides an index of the ϵ_c/k value of each liquid and hence a figure of merit for comparing liquid phosphors. DPT showed the highest ϵ_c/k index and was therefore used in subsequent container tests. Values of absolute counting efficiency were obtained for these different geometries by differential absorption experiments with a calibrated Po-Be neutron source using Geiger counter and scintillation counter detection. Expressions for neutron and gamma counting efficiencies (ϵ_n and ϵ_γ respectively) are also given.

2134
New York Univ.
RESEARCH OF FLUORESCENCE AND THE CONDUCTIVITY PHENOMENA; THIRD QUARTERLY REPORT FOR MONTHS INCLUDING AUGUST, SEPTEMBER, OCTOBER, by Hartmut Kallmann. Dec. 1951. 53p. (NP-3617; Progress Report 3; U20806)

High-energy-induced fluorescence in organic liquid solutions: Light-emission efficiencies from α- and γ-excited organic solutions were compared. The light efficiency from α-particle excitation was calculated to be smaller by a factor of about 40 when compared with the maximum light emission from solutions of terphenyl in xylene. This value was used to relate the experimental values for both types of excitation. The α-particle-source curves had their maxima shifted to larger concentrations than did the γ-ray-source maxima. To explain the variation of light emission with concentration, and the large amount of light resulting from high-energy radiation, a theory is proposed based on the assumption that there is an energy transfer from the excited solvent molecules to the solute, where the energy is trapped. The energy transfer is counteracted by a quenching in the solvent molecules. The fact that solutions containing solvents with double bonds have large fluorescent intensities under high-energy radiation suggests that the energy transfer is mainly associated with the electrons in these double bonds. The theory is generally reconcilable with experimental results. Fluorescent efficiencies and peak-height measurements: Integrated intensity measurements of the fluorescent-light efficiencies relative to anthracene of γ- or α-excited crystals indicated that CsI and CsBr when stimulated by Tl were both superior to anthracene; however, their storage time was less than that of anthracene. Only NaCl, of the alkali halides tested, indicated a practical storing of energy. Correlation between pulse heights and total light output existed for only a small number of crystals, and there was no close correlation between the relative γ-ray values and the α-particle peak heights. The difference between peak values and integrated intensity measurements is attributed to the large emission time constants. cf. TIP U20215. (NRS abst.)

2135
Chemical and Radiological Labs., Army Chemical Center.
CHEMICAL METHODS OF MEASURING RADIATION. Dec. 31, 1951. 3p. (NP-3628)

Work done on radiation dosimetry at University of Illinois, Franklin Institute, and Tracerlab, Inc. is reported briefly. An improved model of the Patterson-Moos dosimeter showed improved stability and retention of calibration but was difficult to read accurately. A search for a suitable solid material for radiation dosimetry showed that the metaphosphoric acid glasses saturated with ZnI_2 were capable of detecting visually 200 kv x rays in a 40 to 600-r range. Borax glasses containing Pb or Bi ions responded to 300 r by a color change to amber.

2136
Chemical and Radiological Labs., Army Chemical Center.
DEVELOPMENT OF RADIATION DOSIMETERS FOR INDIVIDUALS. Dec. 31, 1951. 2p. (NP-3629)

Evaluation of the Patterson-Moos, the Kanwisher, and Taplin chemical dosimeters, and the self-developing Polaroid film badge showed that the Taplin dosimeter most nearly meets army requirements. This dosimeter contains chloroform, H_2O, and an acid-base-indicator dye. The amount of acid generated by action of x or γ radiation on the chloroform is proportional to the dosage received. The dosimeter is stable toward heat and light and appears to be adaptable to mass production. If a requirement for a reader-type of dosimeter is established, the Kanwisher system may be most generally satisfactory.

2137
[Atomic Energy Research Establishment, Harwell, Berks (England)]
WORKING INSTRUCTION MANUAL FOR SCALING UNIT TYPE 200 AND SCALING UNIT TYPE 200A. [nd] 45p. (NP-3650)

This report is a manual of general information on scalers covering performance, construction, installation, maintenance, circuit diagrams, and theoretical information.

2138
[Atomic Energy Research Establishment, Harwell, Berks (England)]
SCALER TYPE 1009A; INTERIM INSTRUCTION MANUAL. Nov. 25, 1948. 6p. (NP-3651)

The present report is a manual of general information on the scaler which covers control settings, accuracy on a random input, connection of other equipments, setting-up instructions, brief description of tube functions and circuit diagrams.

2139
[Atomic Energy Research Establishment, Harwell, Berks (England)]
RATEMETER TYPE 1011; INSTRUCTION MANUAL. May 28, 1948. 18p. (NP-3652)

The present report is a manual of general information on the rate meter which covers setting up and operating instructions, description, maintenance, and circuit diagrams.

2140
Palmer Physical Lab., Princeton Univ.
THEORY AND USE OF PULSE IONIZATION CHAMBERS, WITH EMPHASIS ON RECENT APPLICATIONS, by W. Franzen. Dec. 1, 1951. 97p. (NYO-3003)

The status of our knowledge regarding the production of ionization by nuclear particles in gases is reviewed in the light of recent observations, and the behavior of ionization electrons is discussed. A practical theory of ionization chambers is developed on this basis, and a number of novel applications are described. A review of new developments in the theory and use of proportional counters is presented. (auth)

2141
Technical Information Service, AEC
SCINTILLATION DETECTORS: A SELECTED LIST OF UNCLASSIFIED REPORTS, by Robert L. Morgan. Feb. 25, 1952. 11p. (TID-3023)

A selected list is compiled of references on theory, design and development of scintillation detectors. Material is compiled from report literature written within the past four years, and available from the Technical Information Service.

2142
Radiation Lab., Univ. of Calif.
A REFLECTION GONIOMETER FOR THE MICROSCOPE, by Bayard Rankin. Jan. 21, 1952. 10p. (UCRL-1640)

A goniometer is an instrument mounted on a microscope and designed to make use of the reflected image of a light source superimposed upon the field of view. It is made up of three concentric cylinders, of which the innermost clamps to the microscope and provides a bearing for the second, the second and third are free to rotate. A simple mathematical description of an ideal instrument is constructed. Photographs of the instrument are given.

2143
SATELLITE PULSES FROM PHOTOMULTIPLIERS.
T. N. K. Godfrey, F. B. Harrison, and J. W. Keuffel. Phys. Rev. 84, 1248-9(1951) Dec. 15.

In order to study the nature of satellite pulses in scintillation counters, two groups of oscilloscope pictures were studied. In the first group the triggering pulse was a scintillation pulse, while in the second group the triggering pulse was a noise pulse. The fact that there are the same number of satellites per main pulse, within the statistical error, whether the main pulse comes from a scintillation or from photomultiplier noise, indicates that the satellites originate in the photomultiplier rather than in the counter solution. Results of investigations of time distribution of the satellites and their variation in rate of occurrence with photomultiplier voltage are presented in the form of graphs.

2144
REMOVAL OF SPACE CHARGE IN CADMIUM SULFIDE CRYSTALS AND THEIR CONDUCTION PROPERTIES UNDER ELECTRON BOMBARDMENT. R. Ramanna and Ved Prakash Duggal. Phys. Rev. 84, 1251-2(1951) Dec. 15.

The space charge formation in single crystals of CdS has been studied. It was found that the counting rate for Po α particles decreased rapidly with time, the effect being greater at lower fields across the crystal. In order to eliminate this effect the crystal was heated for one minute by means of a hot wire. It was found that for the first half hour the counting rate increased and then remained constant for about five hours. This method was tried for several crystals and found reliable. The conduction properties of CdS crystals under electron bombardment were also studied. The amplification factor was found to be of the order of 10^3, and this remained constant for several hours. It seems that an equilibrium is reached between the electrons trapped and the reemission of these electrons resulting from the heating effect of the bombarding electrons. The crystal current is steadier at smaller values of the incident current. A graph of crystal current vs. electron energy at various voltages from 150 to 348 v across the crystal shows that the increase in current with electron energy is not linear.

2145
STUDIES ON THE LINEARITY OF A SCINTILLATION GAMMA-RAY SPECTROMETER. V. O. Eriksen and G. Jenssen. Phys. Rev. 85, 150(1952) Jan. 1.

Report is made of measurements of the linearity between pulse height and absorbed energy in a single NaI(Tl) crystal in the region 0.05 to 0.5 Mev. A linear relationship in this region is indicated. A 10-channel pulse-height analyzer was used for the pulse-height analysis, and γ energies were taken from Nuclear Data (National Bureau of Standard Circular 499(1950)).

2146
SPECTROMETRIC MEASUREMENT OF β-β COINCIDENCES. O. Huber, F. Humbel, H. Schneider, and A. de Shalit. Helv. Phys. Acta 25, 3-34(1952) Feb. 1. (In German)

A β-β coincidence arrangement which uses the high resolving power of a lens spectrometer is described. A scintillation counter is added as a β detector near the radioactive source of the lens spectrometer. Coincidences are registered between the counts of this detector and the electrons of a chosen energy in the G-M counter of the spectrometer. It was found that this arrangement is sufficient for establishing decay schemes, even though coincidences are measured between a selected electron line and all other emitted β radiation. Some applications are discussed, and the coefficients of internal conversion of the γ rays and x rays are given for the isotopes Au^{198}, In^{111}, and Cd^{109}. (auth)

2147
A NEW CIRCUIT FOR IONIZATION VACUUM GAUGE.
Hideo Sibata. Rev. Sci. Instruments 23, 54-5(1952) Jan.

The new circuit for the ionization vacuum gage was found to save cost of maintenance while improving speed of measurement and sensitivity. With this circuit the ratio between ion current and electron current is measured directly, with no need to maintain the latter constant.

2148
IONIZATION GAUGE WITH THORIA-COATED CATHODE.
O. A. Weinreich and H. Bleecher. Rev. Sci. Instruments 23, 56(1952) Jan.

A brief description is given of an ion gage with thoria-coated Ir cathode. It was found not to be damaged by exposure, when hot, to air of atmospheric pressure. Although normally used at 10^{-7} mm Hg, a sufficient amount of stable electron emission was available in O_2 pressures as high as 10^{-2} mm Hg.

2149
MEASUREMENT OF ARTIFICIAL RADIOACTIVE ISOTOPES IN MEDICAL RESEARCH. II. ELECTROSCOPE, SCINTILLATION COUNTER, AUTORADIOGRAPHY, DOSE PROBLEMS, PROTECTIVE MEASURES, ABSOLUTE MEASUREMENTS. Kurt Schmeiser. Klin. Wochschr. 29, 757-61 (1951) Dec. 1. (In German)

Some of the principles involved in detection and measurement of radioactive isotopes are reviewed briefly.
29 references.

2150
DETERMINATION OF AUGER COEFFICIENTS WITH THE AID OF SPECTROMETRIC COINCIDENCE MEASUREMENTS.
O. Huber, F. Humbel, H. Schneider, and A. de Shalit. Helv. Phys. Acta 24, 627-8(1951) Dec. 31. (In German)

Use of a coincidence apparatus in a lens-type β spectrometer to separate internal-conversion electrons from γ radiation is described briefly. Auger coefficients thus determined for Ag^{109} agree with data in the literature.

2151
THE ELECTRONIC APPARATUS OF A [COUNTER] TELESCOPE FOR THE STUDY OF THE PRODUCTION AND SCATTERING OF IONIZING AND PENETRATING PARTICLES OF COSMIC RADIATION. R. Favre. Helv. Phys. Acta 24, 599-602(1951) Dec. 31. (In French)

The circuits illustrated have been designed to identify the particular counter or counters activated by an anticoincidence telescope. The superiority of these circuits to that of Regener (in Cosmic Rays by L. Janossy. Oxford, Clarendon Press, 1948. p.55) is discussed.

2152
ON THE RELIABILITY OF GEIGER-COUNTER RESPONSE AT MODERATELY HIGH RATES. L. G. Parratt and C. F. Hempstead. J. Applied Phys. 22, 1502-3(1951) Dec.

The inconstancy of the ratio of spurious to valid counts for a Geiger counter is shown to depend upon counting rate, length of the discharge, immediate past counting history, tube age, and the overvoltage. These factors are shown to be a menace to accurate counting, even after correction, at rates in excess of a few hundred counts/sec.

2153

A COMPARISON OF THREE SURVEY INSTRUMENTS EXPOSED TO VARIOUS RADIATIONS. Russell F. Cowing, Egilda DeAmicis, and Charles K. Spalding. Am. J. Roentgenol. Radium Therapy 66, 961-6(1951) Dec.

Comparison was made of three commercially available radiation detection instruments of the ionization type. The instruments were preset by the γ rays from radium as a standard. Readings were taken with each instrument at established distances from sources of P^{32}, I^{131}, and Rn. From results of this investigation it was concluded that there is a discrepancy in readings for the three ionization-type instruments tested when exposed to the same type of radiation.

2154

A PARALLEL-PLATE COUNTER FOR COSMIC-RAY MEASUREMENTS. Anatol Suszkin. Z. Physik 131, 234-43(1952). (In German)

A parallel-plate counter with adjustable electrode plates is described, and the dependence of its sensitivity and useful voltage on the type of filling (A, CO_2, O_2, alcohol, and mixtures), pressure, and electrode separation is plotted. The response probability is at least 90% of that of an equivalent counter tube.

2155

THE IONIZATION PRODUCED BY HIGH VOLTAGE RADIATION IN AN EXTRAPOLATION CHAMBER WITH WALLS OF VARIOUS ATOMIC NUMBERS AND ITS RELATION TO THAT TO BE EXPECTED THEORETICALLY. A. A. K. Ibrahim and C. W. Wilson. Brit. J. Radiol. 25, 57-68(1952) Feb.

Measurements with an extrapolation ionization chamber are described which aim to measure the ionization within chambers with high Z walls when the chamber dimensions are extrapolated to zero. The extrapolated values of ionization per unit volume are compared with those calculated from the Bragg-Gray theory. They agree well with the theoretical values for elements at least up to $Z = 13$(Al) for radiations up to 0.5A. For elements of greater Z and for λ above about 0.10A, agreement is not found between the experimental results and the original theory. Better agreement can be obtained if the theory is modified so as to take into account the fact that in the ejection of the photoelectrons from the K shell of the wall material, and appreciable proportion of photon energy is used. The significance of these results is discussed from the point of view of measuring the energy absorbed in media. (auth)

2156

ON AN AUTOMATIC WILSON CLOUD CHAMBER IN A MAGNETIC FIELD AND SOME ASSOCIATED TECHNIQUES. Ranjit Kumar Das. Indian J. Phys. 25, 481-90(1951) Oct.

A 1-ton electromagnet for use in cosmic-ray research with a shallow cloud chamber has been installed in the Institute of Nuclear Physics, Calcutta University. For convenience in photography, one of the pole pieces has been bored. The field strength attainable with a current of 7 amp is about 3630 gauss over the effective region in the pole gap. A shallow cloud chamber, 2.5 cm deep and 15 cm in internal diameter, has been used. A complete description of the automatic-sequence control mechanisms is given. In automatic test runs, the performance of the apparatus has proved quite satisfactory. (auth)

2157

RANGE-ENERGY RELATION FOR PROTONS IN ILFORD C2 DRY EMULSION. F. A. El-Bedewi. Proc. Phys. Soc. (London) 64A, 1079-83(1951) Dec. 1.

The range-energy relationship for protons of energies up to 12 Mev in Ilford C2 dry emulsion has been determined with an accuracy better than 0.5% in energy. The particles were produced by bombarding a thin Be foil with 8-Mev deuterons. The energy of the incident deuterons was determined by a method which involves the measurement of the two angles of emission at which the two proton groups of longest range from the reaction $Be^9(d,p)Be^{10}$ have the same energy. (auth)

2158

ON THE SPECTRAL SENSITIVITY OF A NEUTRON COUNTER WITH A MODERATOR. Georg Pfotzer. Z. Naturforsch. 6a, 679-88(1951) Nov. (In German)

A method of calculating the spectral sensitivity of a boron-containing neutron counter with a paraffin moderator is described. The sensitivity is determined by the energy loss of fast neutrons through the moderating process or by the energy distribution of thermal neutrons.

2159

AN APPARATUS FOR COINCIDENCE MEASUREMENTS AND THE COINCIDENCE STUDY OF Mo^{93}, Pd^{103}, AND Hf^{181}. John Luther Hult. Ph.D. thesis, Ohio State University, 1949-50.

This summary of the coincidence method employing G-M tube detectors is based on a review of the literature supplemented by the writer's findings. The apparatus used is described, and the information pertaining to disintegration processes and characteristics of collective and individual radiations obtainable by the analysis of β-γ and γ-γ coincidence methods is discussed. Results of coincidence studies of Mo^{93}, Pd^{103}, and Hf^{181} are included.

2160

THE THEORY OF THE USE OF ALPHA RAY RANGES IN NUCLEAR EMULSIONS FOR THE DETERMINATION OF THE RADIOACTIVE CONTENTS OF MATERIALS. J. H. J. Poole and C. M. E. Matthews. Sci. Proc. Roy. Dublin Soc. 25, 305-16(1951) Dec. 19.

The theory of two methods of determining the Th to U ratio in both thick and thin radioactive sources is discussed. In one method the Th/U ratio is determined from the ratio of α tracks/cm^2 whose horizontal range exceeds the maximum range of RaC′ to the total tracks/cm^2 in a nuclear emulsion. In the other method the ratio is determined from the ratio of the number of tracks whose horizontal range exceeds the maximum range of RaC′ to the number of tracks whose horizontal range lies between the maximum range of RaC and ThA. Some experimental results which confirm the theoretical results are included.

MESONS

2161

Rochester Univ.

PROCEEDINGS OF THE ROCHESTER CONFERENCE ON MESON PHYSICS; JANUARY 11-12, 1952, by A. M. L. Messiah and H. P. Noyes. [nd] 107p. (NYO-3046)

This report covers a summary of remarks made by participants in a small, informal, two-day conference on meson physics. Interactions of π mesons with nuclei and the new unstable particles were discussed.

2162

Radiation Lab., Univ. of Calif.

THE PHOTOPRODUCTION OF NEGATIVE PIONS FROM DEUTERIUM (thesis), by Richard Madey. Jan. 9, 1952. 96p. (UCRL-1634)

Targets of heavy water and ordinary water were irradiated in the 322-Mev bremsstrahlung beam of the Berkeley synchrotron. Scintillation-counter telescopes in coincidence were used as detectors of π^- mesons and protons. Evidence for the reaction $\gamma + n \rightarrow \pi^- + p$ is summarized as follows: (1) The difference in the counting rates from heavy-water and ordinary-water targets has a well-defined peak. This peak occurs at those pairs of correlation angles that are predicted for the photoproduction of a negative pion from a free neutron at rest. (2) The difference in the counting rates from heavy-water and ordinary-water targets essentially disappears when absorbers, which are calculated to stop the maximum expected energy of either a pion or a proton, are inserted in either the pion or the proton detector. (3) At least two ionizing particles are detected in time coincidence. (4) Within experimental error, the process is coplanar. (5) The yield of the heavy water-ordinary water difference counting rate at the correlation angles is compatible with a photopion-production cross section. (6) The net charge of the reaction products is zero. (7) The total angular momentum of the reaction products is half-odd integral. Some extensions of this experiment are discussed briefly. (cf. NSA 6-323.)

2163

THE LIFETIME OF THE μ^+-MESON. W. E. Bell and E. P. Hincks. Phys. Rev. 84, 1243(1951) Dec. 15.

The μ^+-meson lifetime has been determined by stopping the mesons in Fe. Trays of G-M counters in coincidence recorded the distribution of delays between mesons stopping in 3.8 cm of Fe and decay electrons. A least-squares fit to the data gives a mean life $\tau = 2.22 \pm 0.02\ \mu$sec for the μ^+ meson. The corresponding half life is 1.54 μsec.

2164

"ANOMALOUS" π-μ DECAY. H. Primakoff. Phys. Rev. 84, 1255(1951) Dec. 15.

The production of a spectrum of soft photons accompanying the decay of a slow π meson, $\pi \rightarrow \mu + \nu$, is discussed theoretically. Application of the energy and momentum conservation laws to the π-μ decay with accompanying soft-photon emission gives $E_\mu = E^0_\mu(1 - \epsilon/\epsilon_{max})$. E_μ is the kinetic energy of the emitted μ meson, and $E^0_\mu = (M_\pi - m_\mu)^2/2m_\pi = 4.15$ Mev is the maximum value of this kinetic energy; ϵ is the total energy carried off by the soft-photon spectum accompanying the μ meson, and $\epsilon_{max} = \frac{1}{2}(m_\pi - m_\mu) = 17.1$ Mev is the maximum value of this total energy. A formula is given for the probability that any particular π-μ decay is accompanied by a soft-photon spectrum carrying off a total energy between ϵ and $\epsilon + d\epsilon$. It is found that occasionally—probability per decay $\approx 10^{-3}$ to 10^{-4}—the soft-photon spectrum accompanying the emitted μ meson carries away so much energy that he μ meson appears with an "anomalously" small energy, and therefore an anomalously short range in, for example, a photographic emulsion.

2165

PRODUCTION CROSS SECTIONS FOR π^+- AND M$^-$-MESONS BY 340-MEV PROTONS ON CARBON AND LEAD AT 90° TO THE BEAM. C. Richman, M. Weissbluth, and H. A. Wilcox. Phys. Rev. 85, 161-5(1952) Jan. 15 (cf. NSA 4-2345.)

Carbon and Pb targets were bombarded by 340-Mev protons produced by the Berkeley 184-in. synchrocyclotron. The spectrum of π^+ and π^- mesons produced at $90° \pm 12°$ to the beam was measured by the use of nuclear emulsions embedded in absorbers. The total cross section for the production of π^+ mesons from C at this angle is $2.3 \pm 0.5 \times 10^{-28}$ cm^2 ster^{-1}, and the π^+-to-π^- ratio is 5.1 ± 1.0. For Pb the cross section for π^+ mesons at this angle is $7 \pm 2.1 \times 10^{-28}$ cm^2 ster^{-1} and the π^+-to-π^- ratio is 1.5 ± 0.4. (auth)

MOLECULAR PROPERTIES

2166

Massachusetts Inst. of Tech.

QUARTERLY PROGRESS REPORT NO. 3. Jan. 15, 1952. 31p. (NP-3594; Quarterly Progress Report No. 3; U2066)

The following projects in solid-state and molecular physics are summarized: (1) effect of chemical combination on the internal conversion in Tc; (2) a soluble problem in energy bands; (3) the 1-electron approximation in the theory of molecules and crystals; (4) solution of the 1-dimensional wave equation; (5) self-consistent fields for atoms; (6) energy bands in solids; (7) crystalline field in chrome alum; (8) molecular orbital calculations for the CH$_4$ molecule; (9) theory of molecular O; (10) internal field in a cubic unit cell; (11) superlattice stability; (12) Heisenberg's model of ferromagnetism; and (13) resonant frequency of a perturbed cylindrical cavity with Ge as a center post. cf. TIP U19754. (NRS abst.)

NUCLEAR PHYSICS

2167

Ames Lab.

NEW TECHNIQUE FOR THE DETERMINATION OF PHOTONUCLEAR CROSS SECTIONS, by Lester L. Newkirk. Feb. 18, 1952. 9p. (ISC-201)

The development of a technique for measuring photonuclear cross sections is reported and its application to the Cu$^{63}(\gamma,n)$Cu^{62} and C$^{12}(\gamma,n)$C^{11} reactions up to 6 Mev is discussed. The synchrotron beam is monitored by having a mechanical device oscillate the test sample and a monitor sample, alternately, into the beam. The electron energy of the synchrotron, meanwhile, is switched between the desired test value and a standard value. Random or long-term changes in beam value can then be allowed for.

NUCLEAR PROPERTIES

2168

Los Alamos Scientific Lab.

ACTIVATION CROSS SECTIONS FOR 14-MEV NEUTRONS, by Stuart G. Forbes. [nd] 10p. (AECU-1883; LADC-1103)

Cross sections for several nuclear reactions induced by 14-Mev neutrons were measured by the activation method. The number of activated atoms was determined by absolute β-counting. Corrections for finite sample thicknesses were determined experimentally in every case. Cross sections for the following reactions were measured: (n,2n) for Cu^{63}, Cu^{65}, Ag^{107}, and Ag^{109}; (n,p) for Al^{27}, P^{31}, Fe^{56}, and Cu^{65}; (n,α) for Al^{27}. (auth)

2169

"SLOW BEATS" IN F^{19} NUCLEAR SPIN ECHOES. E. B. McNeil, C. P. Slichter, and H. S. Gutowsky. Phys. Rev. 84, 1245-6(1951) Dec. 15.

It has been found that the F^{19} spin echoes in BrF$_5$ and IF$_5$ exhibit slow beats. Typical echo envelopes and individual echoes for BrF$_5$ are shown. Results of a first-order perturbation calculation of the echo envelope show that the slow beats originate from the interaction responsible for the steady-state multiplets, and the calculations also explain the echo asymmetries.

2170

CHEMICAL SHIFT AND FIELD INDEPENDENT FREQUENCY MODULATION OF THE SPIN ECHO ENVELOPE. E. L. Hahn and D. E. Maxwell. Phys. Rev. 84, 1246-7(1951) Dec. 15.

Further investigation of the echo-envelope modulation effect has been carried out and related to measurements made by slow-passage nuclear-resonance methods. The envelope-modulation effect is observed in molecules in which nuclear magnetic dipoles have neighboring nuclear dipoles in nonequivalent chemical environments. For a special case involving two nonequivalent nuclei the shape of the echo envelope is predicted by describing the system with an empirical hamiltonian operator. A Zeeman energy-level diagram for a nonequivalent two-spin system and an echo-envelope plot for protons in dichloroacetaldehyde are shown.

2171

CONNECTION BETWEEN γ—γ AND INTERNAL CONVERSION ANGULAR CORRELATIONS. J. W. Gardner. Phys. Rev. 85, 137-8(1952) Jan. 1.

A completely general and exact correlation formula for the γ-γ cascade $J_A(l_1)J_B(l_2)J_C$ (J's are the total angular momenta of the nuclear levels and l's are the multipole orders of the successive pure transitions) is derived by a double application of the approximate $1/f_k$ (f_k is the factor used to replace a γ quantum by a conversion electron c) to the approximate c-c correlation given by the author in Proc. Phys. Soc. (London) 62A, 763(1949). It was shown algebraically that the anisotropy A obeys the rule $A_{c\text{-}c} \geq A_{c\text{-}\gamma} \geq A_{\gamma\text{-}\gamma}$ for all cascades in which one transition is magnetic or electric dipole with $h\nu < mc^2$, and the other transition is also dipole with $h\nu < mc^2$, or is any higher multipole of any energy. For $1 + a_2P_2(\cos\theta) + a_4P_4(\cos\theta)$ distributions no general rule can be formulated, although it appears that on the average A is about as often increased as decreased by replacing a conversion electron by a γ quantum.

2172

INTERACTIONS BETWEEN NUCLEAR SPINS IN MOLECULES. N. F. Ramsey and E. M. Purcell. Phys. Rev. 85, 143-4(1952) Jan. 1.

Hahn and Maxwell recently reported (Phys. Rev. 84, 1246(1951)) a spin-echo experiment which indicates the existence of an interaction of the form $4J\hbar I_1 \cdot I_2$ between two protons in dichloroacetaldehyde, with $J/2\pi$ being 0.7 cps. It is the purpose of this note to point out a mechanism which should give rise to an $I_1 \cdot I_2$ interaction of the magnitude observed. This mechanism is the magnetic interaction between each nucleus and the electron spin of its own atom together with the exchange coupling of the electron spins with each other. In terms of perturbation theory the proposed mechanism corresponds to a second-order perturbation by the higher electronic triplet states of molecules with the perturbing interaction being the magnetic interactions of each nucleus with the electron spins. The effects of the perturbation terms were calculated approximately for molecular HD, and the results were of the same order of magnitude as the terms considered by Hahn.

2173

CLASSIFICATION OF THE γ-RADIATION OF Hf^{177}. F. K. McGowan, E. D. Klema, and P. R. Bell. Phys. Rev. 85, 152-3(1952) Jan. 1.

The γ spectrum of Hf^{177} following β^- decay of Lu^{177} has been examined with a NaI scintillation spectrometer. The lowest energy β^- group leads to an excited state in Hf^{177} followed by γ rays in cascade with energies of 206 and 112 kev, or by a crossover γ of 318 kev (4.5 ± 0.5%). The half life of the excited state at 112 kev above the ground state is $T_{1/2} < 5 \times 10^{-10}$ sec as measured with a delayed coincidence scintillation spectrometer using anthracene detectors. The angular correlation of the γ rays is anisotropic. Experimental and theoretical internal conversion coefficients for the cascade γ rays are tabulated, and it is concluded that the 318-, 206-, and 112-kev transitions are of E1, E1, and E2 type, respectively. Angular momenta and relative parities of the nuclear states are assigned, in partial contradiction to the Mayer shell model.

2174

LIMITS OF STABILITY OF THE HEAVY ELEMENTS AND THE EFFECTS OF NUCLEAR SHELL STRUCTURE. P. S. Greifinger. Phys. Rev. 85, 253-6(1952) Jan. 15.

The systematics of β decay, α emission, and spontaneous fission are investigated in order: first, to determine the theoretical limits to the periodic table, and secondly, to examine the effects of nuclear shell structure on the end of the periodic table. Curves of β stability and lifetimes against alpha emission and spontaneous fission are drawn for the heaviest elements and extrapolated in order to yield information about the stability or form of instability of the transuranic elements. Nuclear shell structure is seen to be responsible for the stability of Th^{232} and U^{238} as well as the instability of the group of highly radioactive elements beginning with Po. (auth)

2175

NUCLEAR SPIN AND MAGNETIC MOMENT OF RHODIUM ${}^{103}_{45}Rh$. H. Kuhn and G. K. Woodgate. Proc. Phys. Soc. (London) 64A, 1090-7(1951) Dec. 1. (cf. NSA 5-3510)

The radiation from a hollow-cathode tube containing Rh was passed four times through an atomic beam of Rh. Absorption was found in eight lines, four of which showed hyperfine structure doublets of separation 0.023 cm^{-1}. The splitting could be ascribed to the ground state $4d^8\,5s\,{}^4F_{9/2}$. It is concluded that the spin of the nucleus Rh^{103} has the value $I = \frac{1}{2}$. The relative intensities of the components show that the magnetic moment is negative. The observed splitting leads to an estimated value of $\mu = -0.10$ nuclear magneton. The values of I and μ indicate a configuration $(5g_{9/2})^6 3p_{1/2}$ for the last seven protons of the rhodium nucleus in the Goeppert-Mayer model. (auth)

2176

INTERFERENCE IN THE DIRECTIONAL CORRELATION OF CONVERSION ELECTRONS. J. W. Gardner. Proc. Phys. Soc. (London) 64A, 1136-8(1951) Dec. 1. (cf. NSA 4-1312; 5-6491)

In an earlier paper (Proc. Phys. Soc. (London) 64A, 238 (1951)) the directional correlation between the two conversion electrons successively ejected from an atom whose nucleus undergoes transitions $A \rightarrow B \rightarrow C$ was calculated for pure electric-pure magnetic and pure magnetic-pure magnetic cascades. It was remarked also that, to the approximation imposed by the initial assumptions, in cascades with either or both transitions a mixture of electric and magnetic multipoles could be treated by taking just a weighted mixture of the appropriate pure cascades, there being no interference terms. The present note shows that this non-appearance of interference terms in c-c and c-γ correlations derives essentially from two assumptions, namely, that the conversion electrons are ejected from an initial s-state, and that non-relativistic treatment of internal conversion is justified. If either or both of these assumptions be disallowed the correlation formula will, in general, contain interference terms.

2177

NUCLEAR SPIN OF ${}^{53}_{24}$CHROMIUM. B. Bleaney and K. D. Bowers. Proc. Phys. Soc. (London) 64A, 1135-6(1951) Dec. 1.

Paramagnetic resonance measurements of the hyperfine structure (hfs) of a crystal of potassium chromium selenate alum, diluted with the corresponding Al alum and grown from heavy water, have indicated an over-all splitting of $\simeq 50$ gauss. Repetition of the measurements on a sample enriched in Cr^{53} confirmed a value of $\frac{3}{2}$ for the Cr^{53} spin. The electronic splitting $|2D|$ in zero magnetic field was found to be 0.21 cm^{-1} by fitting the spectrum to the hamiltonian. From the ratio of hfs of Cr^{+3} and V^{++}, the magnetic moment of Cr^{53} was estimated as 0.45 ± 0.1 nuclear magneton. The hfs in zero magnetic field splits the electronic levels ($\pm\frac{3}{2}$) into four equally spaced doublets with an over-all separation of $0.001_9\,^\circ K$. The splitting of the ($\pm\frac{1}{2}$) levels is more complicated. There are two singlets at -0.0060 and $+0.0046$, and three doublets at -0.0055, $+0.0041$ and $+0.0020$, these values being in degrees Kelvin relative to the position of the unsplit line.

NUCLEAR REACTORS

2178

Los Alamos Scientific Lab.
GAS RECOMBINATION SYSTEM OF THE LOS ALAMOS HOMOGENEOUS REACTOR, by M. E. Bunker, R. P. Hammond, L. D. P. King, J. A. Leary and W. R. Wykoff. Issued Mar. 6, 1952. 27p. (LA-1337)

The described gas-recombination system installed on the Los Alamos homogeneous reactor consists of the following components: a reflux condenser to cool the reactor exit gas; a trap to stop any entrained liquid; a circulating blower; two separately valved and separately removable chambers containing platinized alumina pellet catalyst on ceramic supports, the second to be used upon exhaustion of the first; a condenser for returning recombined water to the reactor; and an overpressure relief valve. The entire system was made of 347 stainless steel and has operated satisfactorily for nine months.

2179

THE ALPHA SPECTRA OF THE REACTIONS $Li^8(,\beta)2\alpha$ AND $B^{11}(p,\alpha)2\alpha$ AND THE POSSIBILITIES OF TRIPARTITION OF THE C^{12*} COMPOUND NUCLEUS. Raymond Chastel. Compt. rend. 234, 522-3(1952) Jan. 28. (In French)

The difficulties encountered in interpreting the results reported by numerous authors on the α spectra of the Li^8 $\beta + 2\alpha$ decay and the $B^{11}(p,\alpha)2\alpha$ reaction are resolved by assuming the tripartition of a C^{12*} compound nucleus during the B reaction, which should be written $B^{11}(p,3\alpha)$. 13 references.

2180

THE G.L.E.E.P. AS AN ABSOLUTE STANDARD OF THERMAL NEUTRON DENSITY. D. J. Littler, E. E. Lockett, and B. T. Price. Proc. Phys. Soc. (London) 64A, 1139-40 (1951) Dec. 1. (cf. NSA-5-6285)

The GLEEP has been calibrated for use as a standard of thermal neutron density in the range 10 to 2×10^4 neutrons/cm^3, the density being known throughout the range to ±5%. An absolute determination of the total thermal neutron density was made by measuring the neutron absorption cross section of Na^{23} and determining its rate of absorption of thermal neutrons. The absolute measurement was made in terms of the current from an ion chamber permanently situated 1 m from the center. Another measurement of absolute thermal neutron density has been made by a determination of the absolute β-activity of a sample of Mn irradiated in the BEPO, combined with a measurement in the GLEEP of the neutron-absorption cross section of Mn at 2200 m/sec. The mean velocity of thermal neutrons in the GLEEP was found to be ~2690 m/sec at a pile temperature of 300°K.

NUCLEAR TRANSFORMATION

2181

Ames Lab.
RADIOACTIVITIES OF PLATINUM AND IRIDIUM FROM PHOTONUCLEAR REACTIONS IN PLATINUM, by Darleane Christian, Russell F. Mitchell, and Don S. Martin, Jr. (ISC-180(Rev.))

The products of photonuclear reactions induced in Pt by a 70-Mev synchrotron x-ray beam have been studied. No Os activities were found. The Ir fraction included Ir^{192} and Ir^{194} and two new isotopes: a 140 min, 1-Mev β^- emitter, probably Ir^{195}, and a 7-min activity, probably Ir^{197}. Pt^{193}, Pt^{197} and the 88-min isotope which decays by isomeric transition were found in the Pt fraction. Some evidence is presented to question the assignment of the 88-min activity to Pt^{195}. Relative yields of all these radioactive isotopes have been measured. (auth)

2182

DIFFERENTIAL CROSS SECTION OF THE REACTION $He^3(d,p)He^4$ AT 10.2-Mev BOMBARDING ENERGY AND SEARCH FOR EXCITED STATE IN He^4. J. C. Allred. Phys. Rev. 84, 695-9(1951) Nov. 15.

The differential cross section of the reaction $He^3(d,p)He^4$ has been measured by means of a photographic technique. The cross section shows a high degree of asymmetry and is quite similar to that previously measured for the $T(d,n)He^4$ differential cross section at 10.5 Mev. This similarity suggests equality of p-p and n-n forces. Observations of the short-range particles from bombardments of He^3 and T gases under identical conditions permit the assignment of upper limits for the reaction $He^3(d,p')He^{4*}$. At a laboratory angle of 90°, the cross section is less than $0.2 \times 10^{-27} cm^2$ for an excited state below 20.9 Mev. (cf. LA-981; NSA 4-5974) (auth)

2183

ISOLATION OF RADIOACTIVE C^{11} FORMED BY THE INTERACTION OF π^- MESONS ON OXYGEN AND NITROGEN. A. Turkevich and J. B. Niday. Phys. Rev. 84, 1253-4(1951) Dec. 15.

The 145-Mev π^--meson beam of the University of Chicago synchrocyclotron was bent through 45° by an analyzing magnet and made to impinge on samples of acidified water or saturated NH_4NO_3 solution in gas-tight glass vessels. The solutions also contained ~15 mg of CO_2 added as $NaHCO_3$, and in the last experiments, some CO. After irradiation the radiocarbon in the chemical forms of CO and CO_2 was swept out of the sample with an inert gas, passed over hot CuO to oxidize the CO to CO_2, and then absorbed in 100 ml of dilute NaOH solution. Calcium carbonate was precipitated from the solution and the precipitate was mounted and counted with an end-window Geiger tube. It was established that the radioactivity produced decayed with the expected half life of 20.5 min and that the radiations had the proper absorption characteristics for C^{11}. The results indicate that C^{11} is the product of about 2% of the interactions of the mesons with O^{16}. The yield of C^{11} with the NH_4NO_3 solutions appears to be significantly higher. A possible explanation is that a four-fold higher yield of C^{11} is obtained from N^{14} than from O^{16}.

2184

RADIOACTIVE Pm^{148} AND Pm^{150}. John K. Long and M. L. Pool. Phys. Rev. 85, 137(1952) Jan. 1.

Oxides of enriched Nd isotopes were bombarded with 6-Mev protons, and the decay of the products was followed with a Geiger counter and a Wulf electrometer. The sign of the charge of the β particles was determined by magnetic deflection. By comparison of intensity of activity with per cent abundance of isotopes present, the 48-day activity was assigned to Pm^{148}, formed by the reaction $Nd^{148}(p,n)Pm^{148}$. The 48-day activity is accompanied by β^- particles of 1.7 ± 0.1 and 0.6 ± 0.1 Mev, and γ radiation of about 0.54 Mev. The 2.7-hr activity is apparently formed by a (p,n) reaction on Nd^{150}; the particle radiation associated with the 2.7-hr activity is negative in sign, and the β end point was observed at 2.4 ± 0.2 Mev by absorption measurements in Al.

2185

NUCLEAR REACTION ENERGIES. D. M. Van Patter, A. Sperduto, P. M. Endt, W. W. Buechner, and H. A. Enge. Phys. Rev. 85, 142-3(1952) Jan. 1.

Q-values measured by means of the 180° magnetic spectrograph at MIT are tabulated for the following reactions: (d,p) on Ne^{20}, Ne^{22}, Mg^{25}, Mg^{26}, Si^{29}, Mg^{24}, Si^{30}, and P^{31}; (p,α) on Na^{23}, Al^{27}, and P^{31}; (d,α) on Mg^{25}, Si^{29}, and P^{31}. Comparison is made with the most recent results of other workers, and the internal consistency is checked by closedcycle examinations. The calculated disintegration energies of Na^{24}, Mg^{27}, Al^{28}, and Si^{31} are also given.

2186
PROTONS AND DEUTERONS FROM Li^{6} + T REACTIONS. T. P. Pepper, K. W. Allen, E. Almqvist, and J. T. Dewan. Phys. Rev. 85, 155-6(1952) Jan. 1.

Hydrogen containing 10% T was used in the Chalk River 200-kv high-tension set, and the mass-three component, T^{+} and HHH^{+} ions, of the beam was magnetically selected to bombard a Li^{6}F target. The charged particles emitted at 90° to the beam were deflected through 90° in a homogeneous magnetic field, and were detected by a ZnS Ag-activated screen with an RCA 5819 photomultiplier. The photomultiplier pulses were amplified and fed into a 30-channel pulse-height analyzer. The momentum distributions of the deuterons and protons from the reactions (1) Li^{6}(t,d)Li^{7}, (2) Li^{6}(t,d)Li^{7*}, and (3) Li^{6}(t,p)Li^{8} are shown. The α and He^{3} particles from Li^{6}(p,α)He^{3} coincided with the deuteron group from (1), a coincidence which permitted the following determination of Q values in terms of the known Q value of the (p,α) reaction: (1) 0.982 ± 0.007 Mev, (2) 0.503 ± 0.007 Mev, and (3) 0.784 ± 0.015 Mev. Reaction (1) accounts for ~54% of all the disintegrations emitting particles at 90° to the beam, reaction (2) for ~14%, and reaction (3) for ~2%.

2187
NEUTRONS FROM THE DISINTEGRATION OF THE SEPARATED ISOTOPES OF SILICON BY DEUTERONS. C. E. Mandeville, C. P. Swann, S. D. Chatterjee, and D. M. Van Patter. Phys. Rev. 85, 193-6(1952) Jan. 15.

The neutron spectra from deuterons on Si have been studied by the method of recoil protons and photographic plates. Thick isotopic targets of the three separated isotopes of Si were irradiated by deuterons of energy 1.4 Mev, supplied by the Bartol Van de Graaff statitron, observations being carried out at angles of 0 and 90° with the incident deuterons. Q-values, from which energy levels in the residual nuclei of P are calculated, are as follows:

Reaction	Q-values (Mev)
Si^{28}(d,n)P^{29}	0.29
Si^{29}(d,n)P^{30}	3.27, 2.52, 1.81, 1.27
Si^{30}(d,n)P^{31}	4.92, 4.59, 3.73, 2.70, 1.51

The estimated probable error in the Q-values is 40 kev. (auth)

2188
RADIATIVE CAPTURE OF PROTONS BY C^{13}. John D. Seagrave. Phys. Rev. 85, 197-203(1952) Jan. 15.

The reaction C^{13}(p,p)N^{14} has been studied experimentally for proton bombarding energies between 0.4 and 2.7 Mev. Targets of C enriched in the isotope C^{13} were prepared, and thick and thin target excitation functions obtained. Five resonances were found, corresponding to excited states of N^{14} at 8.05, 8.62, 8.70, 9.18, and 9.49 Mev. The radiation spectrum from these levels was found to involve several branches of decay and transitions cascading through intermediate levels. (auth)

2189
AN INVESTIGATION OF ALPHA-PARTICLE GROUPS FROM Al^{27}(d,α)Mg^{25}. E. C. Toops, M. B. Sampson, and F. E. Steigert. Phys. Rev. 85, 280-3(1952) Jan. 15.

The α-particle groups produced by the bombardment of Al by 10.8-Mev deuterons have been measured using nuclear emulsion plates for detection. Seven new levels in Mg^{25} were found at 6.98, 7.85, 8.62, 9.06, 9.75, 10.78, and 11.89 Mev. The previously known level at 4.01 Mev has been resolved into two levels at 3.96 and 4.12 Mev. (auth)

2190
ANGULAR DISTRIBUTION IN THE HIGH ENERGY DEUTERON PHOTOEFFECT. N. Austern. Phys. Rev. 85, 283-90(1952) Jan. 15.

Consideration is given to the possible use of the electric dipole isotropic part of the deuteron photodisintegration cross section as an indicator of weak odd-state noncentral forces. This cross section is not very sensitive to weak tensor forces of the usual type, but is strikingly affected by a singular spin-orbit coupling. While for the usual tensor forces the ratio, a/b, of the isotropic to the $\sin^2\theta$ term in the cross section varies slowly over a broad energy range, it rises rapidly with energy if the noncentral force is strongly singular. Calculation is done in first Born approximation. A detailed estimate of the magnetic isotropic cross section is included, for this is an unexpectedly large "background" to the electric term which is of interest. (auth)

2191
ENERGY AND ANGULAR DISTRIBUTION OF THE LITHIUM γ RADIATION. H. Nabholz, P. Stoll, and H. Wäffler. Helv. Phys. Acta 25, 153-84(1952) Feb. 1. (In German)

The γ-ray spectrum from the Li^{7}(p,γ)Be^{8} reaction has been studied by photographic means, use being made of the C^{12}(γ,α)2α photodisintegration. In addition to the known 17.6- and 14.7-Mev lines, a weak line of ~12.5-Mev energy was detected. For both intense lines, an isotropic (within 20%) angular distribution was found with 440-kev resonance protons. Coincidence measurements confirmed the results of the photographic method. The highly anisotropic nonresonant γ rays could be observed when 550-kev protons and thicker Li targets were used. Capture of s protons can explain the resonant radiation, but the anisotropy of the nonresonant radiation must involve capture of p and/or d protons.

2192
THE PHOTODISINTEGRATION OF C^{12} INTO THREE α PARTICLES BY γ RADIATION UP TO 32-MEV. M. Eder and V. L. Telegdi. Helv. Phys. Acta 25, 55-78(1952) Feb. 1. (In German)

The reaction C^{12} + hν = 3 He^{4} has been further investigated in photographic emulsions. By using the bremsstrahlung from a 32-Mev betatron it could be shown conclusively that the cross section reincreases strongly after the known resonancelike peak at ~18 Mev, and some indications of a second maximum around 26 Mev have been obtained. Analyzing the energy distribution of the α-particles resulting from the reaction has demonstrated that a rather radical change in its mechanism is to be made responsible for this reincrease; Be^{8} in the excited state at E^* = 3.0 Mev does not participate in more than about one-third of the disintegrations induced by γ rays above ~19 Mev. The participation of Be^{8} in its ground state appears to increase continuously with energy and this is regarded as evidence that this state has an intrinsic angular momentum zero, assuming that the excited state at 3 Mev has J = 2, which is supported by other evidence. (auth)

2193
INVESTIGATION OF THE B^{10}(n,α)Li^{7} REACTION WITH NEUTRONS OF VARIOUS ENERGIES. H. Bichsel, W. Hälg, P. Huber, and A. Stebler. Helv. Phys. Acta 25, 119-41(1952) Feb. 1. (In German)

For the reaction B^{10}(n,α)Li^{7}, the dependence on neutron energy of the branching ratio K between the transitions to the ground state and the transitions to the 478.5-kev excited state of Li^{7} has been determined with a BF$_3$-A—filled ionization chamber. The following ratios were found from impulse spectra.

Neutron Energy, Mev	K
Thermal	0.070 ± 0.007
0.5	0.31 ± 0.04
1.80	1.7 ± 0.3
2.10	1.5 ± 0.4
2.55	1.5 ± 0.4
2.95	1.8 ± 0.3
3.5	1.4 ± 0.3
3.9	0.9 ± 0.2

The energy Q of the $B^{10}(n,\alpha)Li^7$ reaction also has been determined by the ionization-chamber method. If the work function W(E) of A is constant, Q = 2.695 ± 0.02 Mev. If $W(E) = 27.5 + 1.9E^{-1/2}$ (Cranshaw and Harvey, Can. J. Research 26A, 243(1948)), Q = 2.775 ± 0.02 Mev. For the $D(d,n)He^3$ reaction, Q was found to be 3.24 ± 0.04 Mev. Applicability of the ionization-chamber method to such measurements is discussed.

2194

THE DISINTEGRATION OF LIGHT NUCLEI BY MESON CAPTURE. A. C. Clark and S. N. Ruddlesden. Proc. Phys. Soc. (London) 64A, 1064-78(1951) Dec. 1.

The disintegration by π^--meson capture of He, C^{12}, and O^{16} is discussed. Two types of meson theory, scalar and pseudoscalar, are considered. The relative probabilities of the various modes of disintegration of He are calculated and the energy spectra of the most likely one, viz. proton emission, are shown. The disintegration of C into two α particles and one singly charged particle is considered, using a simple α-particle model. The energy spectra and angular correlations of the α particles obtained by a direct transition and by a transition via an excited state of Be^8 are compared. (auth)

2195

RADIOACTIVITIES OF SILVER BY IRRADIATION WITH FAST NEUTRONS FROM THE Ra + Be-SOURCE. N. K. Saha and K. Gopalakrishnan. Proc. Natl. Inst. Sci. India 17, 301-9(1951) July-Aug.

Neutrons from a 100-mg Ra-Be source are used to irradiate the Ag cathode of a G-M counter and the 22-sec, 2.3-min, and 24-min periods of radiosilver are studied. The 24-min activity is due to Ag^{106} produced by the reaction $Ag^{107}(n,2n)Ag^{106} \xrightarrow{\beta^+} Pd^{106}$. The 2.3-min period due to Ag^{108} can be produced by the simple capture of slow neutrons in Ag^{107} or by the reaction $Ag^{109}(n,2n)Ag^{108} \xrightarrow{\beta^-} Cd^{108}$. From the observations on the relative intensities of the periods developed under different conditions of irradiation the following conclusions were reached. The 24-min activity (Ag^{106}) is produced only by very fast neutrons toward the upper limit of the Ra + Be neutron energy spectrum. About 5% of the usually observed 2.3-min activity with neutrons slowed down by 10 cm of paraffin wax is due to the fast neutrons transmitted by the wax. The cross-sections of the 2.3-min activity for the fast and the slow neutrons are roughly in the ratio 1 to 14. The ratio of the relative yield of the 24-min process to the 2.3-min process produced by fast neutrons is roughly 1 to 42. Roughly about 73% of the neutrons emerging from the 10-cm wax cylinder are slow neutrons (producing the 2.3-min activity of Ag). (auth)

2196

REMARKS ON THE PHOTODISINTEGRATION OF SEVERAL LIGHT ELEMENTS. Raymond Chastel. Compt. rend. 234, 318-20(1952) Jan. 14. (In French)

Recent literature on the mechanism of γ reactions of Li^6, B^{10}, B^{11}, C^{12}, N^{14}, and O^{16} involving formation of three or four particles is summarized briefly, and in some cases criticized. 19 references.

PARTICLE ACCELERATORS

2197

Ohio State Univ.

DEVELOPMENT OF AUXILIARY CYCLOTRON EQUIPMENT FOR USING TRITIUM AS BOMBARDING PARTICLES IN A CYCLOTRON, by D. N. Kundu, F. G. Boyle and M. L. Pool. Dec. 1951. 19p. (NACA-TN-2573)

A circulating system for radioactive tritium was constructed, assembled, and tested. The results showed that the pumping speed of the system was too low for use. With a sufficiently increased pumping speed, it is believed that the circulating system would provide satisfactory operation. (NACA abst.)

RADIATION ABSORPTION AND SCATTERING

2198

Nebraska Univ.

EMPIRICAL RANGE-ENERGY RELATIONS IN GASES AND SOLIDS, by Emerson Jones and Charles J. Cook. [nd] 10p. (AECU-1887)

An empirical range-energy relationship for protons was devised for gases and solids. Excellent agreement was obtained when the relationship was compared with the experimental results for Al obtained by Warshaw (Phys. Rev. 76, 1759(1949)). Tabulated results are also reported for H_2, O_2, Al, Cu, Ag, Au, and Be. It is shown that except for H_2 and Be the value of k/z, where k is a constant and z is the atomic number, is equal to 0.1 to within 3%. The experimental and calculated values of E_0 (the energy at which the energy loss is a maximum) for all the elements show an average difference of 8%. The greatest difference comes in the case of Be for which k/z is almost twice the value for the rest of the elements.

2199

Nebraska Univ.

RANGE OF PROTONS IN HYDROGEN AND OXYGEN, by Charles J. Cook, Emerson Jones and Theodore Jorgensen. [nd] 14p. (AECU-1890)

An abstract of this report was indexed as report AECU-1812 and appeared in Nuclear Science Abstracts as NSA 6-1339.

2200

Radiation Lab., Univ. of Calif.

ABSOLUTE PHOTON ATTENUATION CROSS SECTION FOR NON-PAIR PROCESSES IN BERYLLIUM AT 300 MEV (thesis), by Robert Warner Kenney. Feb. 1, 1952. 54p. (UCRL-1654)

The total cross section for the attenuation of 300-Mev photons by non-pair-forming processes in Be has been found to be $0.149 \pm 0.023 \times 10^{-25}$ cm²/Be atom. This result is 18% higher than the theoretical total Compton cross section in Be at 300 Mev. A table of photon interactions with nuclei is given; their cross sections in Be at 300 Mev are estimated; and their theoretical dependences on Z and energy are included. It is seen that the non-pair, non-Compton processes contribute at least 10% of the measured cross section. From the data, one can only conclude that the Klein-Nishina formula is correct to within 15% at 300 Mev. The total absorption cross sections at 300 Mev in Be and Pb are given. The ratio of the pair-forming cross sections at 300 Mev in Be to those in Pb have been found to be $3.90 \pm 0.066 \times 10^{-3}$.

2201

SCATTERING OF 30-MEV ALPHA-PARTICLES BY HELIUM. E. Graves. Phys. Rev. 84, 1250-1(1951) Dec. 15.

The angular distribution of elastic scattering of 30-Mev α particles by He has been measured, using the emergent beam of the MIT cyclotron. Scattered α particles were detected with a double proportional counter, which could be rotated within a scattering chamber filled with He at 1 or ½ atm. The outputs of the two shallow counters, located back to back, were placed in time coincidence to reduce background. The absolute differential cross section was measured by comparison with the elastic scattering from a gold-foil target to be $2.8 \pm 0.7 \times 10^{-26}$ cm²/steradian at 83.2° (cm). No evidence was found for an excited state in He^4 up to 14 Mev. A theoretical curve was fitted to the scattering data by means of an expansion in partial waves involving the 0th-, 2nd-, and 4th-order phase shifts due to nuclear scattering.

2202

QUADRUPOLE RADIATION IN nD CAPTURE. N. Austern. Phys. Rev. 85, 147(1952) Jan. 1.

The contribution of the electric quadrupole process to the cross section for capture of thermal neutrons by deuterons has been calculated and found to be completely negligible, in contradiction to an earlier estimate by the author (Phys. Rev. 83, 672(1951)). The capture must therefore proceed entirely by the emission of magnetic dipole radiation, and may be exclusively a result of the presence of interaction currents.

2203

THE ABSORPTION OF GAMMA-RAYS FROM Co^{60}. Sakae Shimizu, Tetsuya Hanai, and Sunao Okamoto. Phys. Rev. 85, 290-4(1952) Jan. 15.

Measurements of the absorption of γ rays from Co^{60} (1.17 and 1.33 Mev) have been made in 27 elements. In order to exclude the errors due to secondary radiations which might be produced in neighboring objects and in the absorbers, particular precautions were taken with respect to the geometrical arrangement of apparatus. The absorption coefficients measured for the elements whose atomic numbers are less than ${}_{52}Te$ show reasonable agreement with those calculated according to existing theories. However, it is noted that the results with ${}_{73}Ta$, ${}_{74}W$, ${}_{78}Pt$, ${}_{79}Au$, ${}_{80}Hg$, and ${}_{81}Tl$ are 3 to 5.5 per cent less than the theoretical values. It seems improbable that the disagreements observed in these elements may be assigned to experimental causes. If the entire deviation were assigned to inaccuracy in theoretical knowledge, it would be reasonable to attribute it to some insufficiency in the Klein-Nishina theory of the Compton effect for this energy of γ rays. But further investigation should be undertaken to ascertain the fact. (auth)

2204

SCATTERING OF FAST NEUTRONS FROM O^{16}. E. Baldinger, P. Huber, and W. G. Proctor. Helv. Phys. Acta 25, 142-52(1952) Feb. 1. (In German)

Details of observations summarized in a letter to the editor in Phys. Rev. 84, 1058(1951) Dec. 1; NSA 6-1895 are presented.

2205

RADIATIVE CORRECTIONS TO COMPTON SCATTERING. L. M. Brown and R. P. Feynman. Phys. Rev. 85, 231-44 (1952) Jan. 15.

Corrections of order e^6 to the differential cross section for Compton scattering of unpolarized radiation by electrons are computed. The results for corrections ascribable to virtual photons are finite, relativistically invariant, and valid at all energies, but contain a term which depends logarithmically on an assumed small photon mass λ. A cross section of the same order has also been obtained for double Compton scattering in which one of the emitted photons has an energy small compared to the rest mass of the electron (with the electron initially at rest). This contains a term depending on lnλ which exactly compensates the similar term arising from virtual quanta in all observable cases. Approximations for low and high energies, as well as numerical results, are given. These disagree with results obtained previously by Schafroth (Helv. Phys. Acta 23, 542 (1950)). (auth)

2206

MEAN-VALUE CALCULATIONS FOR PROJECTED MULTIPLE SCATTERING. W. T. Scott. Phys. Rev. 85, 245-8 (1952) Jan. 15.

The multiple-scattering theories of Molière (Z. Naturforsch. 3a, 78(1948)) and Snyder-Scott (Phys. Rev. 78, 223 (1950)) are compared and the equivalence of the mathematical development stated. Using the preferable single-scattering probability of the Molière theory, results are quoted of interest to experimenters. Several mean-value quantities are given: mean arithmetic angle, medium angle, half-width, 1/e width, angle $1/P_0\pi^{1/2}$ related to the zero-angle amplitude, and mean arithmetic angle with a cutoff at 4 times the mean. These quantities are given for both the projected tangent angle and projected chord angle distributions, in the form of linear relationships between the square of the angle divided by Ω and the logarithm of Ω, where Ω is the mean number of scatterings undergone by the particle in question. The linear relationships are good to 1 per cent for Ω from 10^2 to 10^5. Information is also given on smoothed-out distributions, and on an estimate of the error for the cut-off arithmetic mean angle. The scattering constant K is given for several methods of measurement, for Ilford G-5 emulsions. (auth)

2207

ANGULAR DISTRIBUTION, IN THE SMALL-ANGLE DOMAIN, OF 3.27-MEV NEUTRONS SCATTERED BY DEUTERONS. I. Hamouda and G. de Montmollin. Helv. Phys. Acta 25, 107-18(1952) Feb. 1. (In French)

The angular distribution of 3.27-Mev (d,d) neutrons scattered by protons and deuterons has been investigated in the cloud chamber. 4000 proton recoils as well as 4000 deuteron recoils have been photographed and measured. The investigation covered the angular range of $\Theta = 18$ to 70°, where Θ = neutron scattering angle in center-of-mass system. The angular distribution of the neutron-proton scattering was found to be isotropic throughout the investigated angular range, which suggested the reliability of the measurements in the case of the neutron-deuteron scattering. The angular distribution data were made to join with the data of a former experiment to represent the angular distribution throughout the range from 18 to 180°. The experiment shows a pronounced maximum at 0°, a minimum around 90°, and a smaller maximum at 180°. (auth)

2208

THE DIFFRACTION OF X-RAYS BY DISTORTED-CRYSTAL AGGREGATES. III. REMARKS ON THE INTERPRETATION OF THE FOURIER COEFFICIENTS. J. N. Eastabrook and A. J. C. Wilson. Proc. Phys. Soc. (London) 65B 67-75 (1952) Jan.

The line profile of the h^{th} order reflection from a set of lattice planes is known to be given by a Fourier series with coefficients $A(h,m) = N(m)J(h,m)$. The function N(m) depends on the particle shapes and sizes, and J(h,m) depends on the state of strain. Neither can be completely determined from the experimental Fourier coefficients for a single value of h. They have, however, different behaviors for small m, and A(h,m) has an unambiguous interpretation in this region only: its initial slope gives the mean particle thickness, and its initial curvature sets a lower limit to the mean-square strain. The practical value of this interpretation is subject to two limitations: (i) the initial shape of the A(h,m) curve depends on the 'tail' of the line profile, (ii) if the crystals are large enough to contain several regions of compression and extension, probability theory shows that J(m) is likely to be approximately proportional to exp $\{-\text{const.}\ |m|\}$ for m large. Extrapolation to small m could then tend to give fictitiously small values for both particle size and strain. The problem of obtaining the greatest possible amount of information from observed line profiles of all orders is discussed. Usually only a few orders can be measured, and the information obtainable is less, but in three special cases the Fourier coefficients of two lines can yield all information obtainable from the full set. (auth)

2209

SELF-ABSORPTION OF THE β RADIATION OF P^{32}. Ch. Haenny and P. Lerch. Helv. Phys. Acta 24, 602-6(1951) Dec. 31. (In French)

The self-absorption of P^{32} β radiation has been measured for the source materials Li_3PO_4, $Mg_2P_2O_7$, $AlPO_4$, $CrPO_4$, $Ba_2P_2O_7$, Ag_3PO_4, and $Pb_3(PO_4)_2$ by varying the mass of the source in a counter arrangement of constant dimensions. Curves of the absorption and self-absorption coefficients plotted against average atomic weight of source material are presented.

2210

ATOMIC SIZE EFFECT IN THE X-RAY SCATTERING BY ALLOYS. B. E. Warren, B. L. Averbach, and B. W. Roberts. J. Applied Phys. 22, 1493-8(1951) Dec.

In a random solid solution, if the two atoms have appreciably different sizes, the nearest-neighbor distances and to a lesser extent the higher neighbor distances will be of three kinds, r_{AA}, r_{AB}, and r_{BB}. The effect produces modulations in the diffuse intensity similar to those produced by short-range order. The size effect is important when the difference in scattering power is large, the difference in size is large, and the short-range order is small. The size effect is illustrated by a single-crystal pattern of Cu_3Au and a powder pattern of Ni_3Au_2. An asymmetry in the wings about a fundamental reflection is a result of the size effect. (auth)

2211

SLOW NEUTRON SCATTERING BY FERROMAGNETIC CRYSTALS. R. G. Moorhouse. Proc. Phys. Soc. (London) 64A, 1097-1107(1951) Dec. 1. (cf. NSA 5-5932)

The magnetic scattering of very slow neutrons by a ferromagnetic is investigated according to the Bloch spin wave model for temperatures up to about one-third of the Curie point. It is found that observable peaks of intensity in the angular distribution of scattered neutrons occur due to spin-wave absorption. Neutrons are also scattered with phonon absorption, and by an analogous calculation it can be shown that similar peaks occur because of this vibrational scattering. A possible method is suggested of differentiating between the two kinds of scattering in order to provide a check of the Bloch model.

2212

THE DIFFERENTIAL CROSS SECTION FOR HIGH ENERGY NUCLEON-NUCLEON COLLISIONS AND THE MEAN SQUARE ANGLE OF SCATTER. H. S. Green and H. Messel. Proc. Phys. Soc. (London) 64A, 1083-90(1951) Dec. 1. (cf. NSA 5-6255)

In an attempt to account theoretically for the lateral and angular development of the penetrating particles in high-energy cosmic-ray showers, a method is developed for deriving the differential inelastic scattering cross section from the total inelastic scattering cross section, in the laboratory frame of reference. An integral equation is set up for the differential cross section and solved assuming that the differential cross section in the centre-of-mass frame of reference is of the form $R + S' \cos^2 \theta$ where R and S' are functions of the incident and scattered energies only. Using a form of the total cross section derived from the analysis of high-energy cosmic-ray experiments, the mean square angle of scatter in a nucleon-nucleon collision has been calculated and found to be inversely proportional to the energy of the incident particle. The results are compared with experiments. (auth)

2213

ON THE DEGREE OF POLARIZATION OF BREMSSTRAHLUNG FROM THIN ANTICATHODES. O. Blunck and K. Doffin. Naturwissenschaften 39, 38-9(1952) Jan. (In German)

A series expansion is derived for the degree of polarization of bremsstrahlung in terms of the kinetic energy of the electron before and after bremsstrahlung emission. Calculated values for 34-kev electrons are compared with experimental results.

RADIATION EFFECTS

2214

Illinois Univ.

PROGRESS REPORT, by J. Marx, J. Koehler, C. Wert, and A. Overhauser. Feb. 1, 1952. 7p. (AECU-1879)

Data are presented on electrical resistance changes produced by deuteron bombardment and subsequent isothermal annealing of Cu, Au, and Ag. It is assumed that the resistivity increase which results from deuteron bombardment of metallic foil is proportional to the number of interstitial-vacancy pairs per cm^3. Equations for pair production, and resistivity increase due to effects of low temperatures on the bombardment are included. Data are compared with Seitz's theory.

2215

ROLE OF OXYGEN-CONTAINING RADICALS IN THE OXIDATIONS AND REDUCTIONS PRODUCED BY IONIZING RADIATIONS. IV. THE CHROMATE/CHROMIC SULFATE SYSTEM. M. Lefort, P. Radhakrishna, and M. Haïssinsky. J. chim. phys. 48, 485-8(1951) Nov.-Dec. (In French)

Irradiation of solutions of Cr(VI) and Cr(III) by Rn α rays in doses up to 20×10^{18} ev/cc resulted in behavior analogous to that observed on addition of H_2O_2; i.e., reduction in acid solution, and weak oxidation in alkaline. Similar irradiation with Ra γ rays or x rays caused reduction in both acid and alkaline media; no oxidation was observed. Formation of O_2 and especially of H_2 by irradiation of dichromate in acid solution was greater than permitted by the amount of reduction. It is concluded that the reduction process includes an intermediate reaction with an OH free radical.

RADIOACTIVITY

2216

Oak Ridge National Lab.

FERMI FUNCTIONS FOR ALLOWED BETA TRANSITIONS, by N. Dismuke, M. E. Rose, C. L. Perry and P. R. Bell. Issued Mar. 7, 1952. 26p. (ORNL-1222)

As part of a program for computing the Coulomb field functions for forbidden β transitions the evaluation of the Fermi function is carried out pertinent to the case of allowed transitions. Specifically, the function $\Phi_0 = \frac{p}{W} L_0F_0$ is computed and tabulated. The Coulomb field or Fermi Function Φ_0 is computed for all Z in the range 2 to 96 in unit steps for both electrons and positrons, and for 34 values of p up to p = 25 for $Z \leq 25$ and 32 values of p up to p = 15 for $Z > 25$. The piecewise uniform scale of p is noted. The accuracy of the entries is 0.1%.

2217

THE RADIOACTIVE DECAY OF Ca^{41}. F. Brown, G. C. Hanna, and L. Yaffe. Phys. Rev. 84, 1243-4(1951) Dec. 15.

Experiments have been performed to detect the characteristic K x rays of potassium (K_α = 3.31 kev) produced by K capture in Ca^{41}. A sample of Ca depleted 200-fold in mass 44 was irradiated in the NRX reactor for 6 weeks. From this a source (A) of Ca oxalate was prepared. For comparison another source (B) was prepared using the same weight of unirradiated Ca oxalate plus a tracer amount of heavily irradiated ordinary Ca, sufficient to give source B the same Ca^{45} β activity as source A. Source B gave pure Ca x rays, and A a mixture of Ca and K x rays. The two sources were also compared by means of a "critical" absorber consisting of 3 mg/cm² of K metal sealed between polystyrene foils. Typical curves of counting rate vs. energy obtained with and without the absorber are shown. By assuming the fluorescence yield of K to be 0.1, the half life of Ca^{41} for K capture was calculated to be $(1.2 \pm 0.4) \times 10^5$ years.

2218

Rb^{86}, A NEW ISOMER OF 1.06-MIN HALF LIFE. A. Flammersfeld. Z. Naturforsch. 6a, 559-60(1951) Oct. (In German)

A new Rb activity has been found in natural Rb irradiated with either slow or fast (Be + d or Li + d) neutrons. The half life is 1.06 ± 0.02 min. absorption measurements indicate 0.78-Mev γ radiation, but the decay scheme is uncertain.

2219

ABSENCE OF SPONTANEOUS EMISSION OF NEUTRONS FROM SAMARIUM. S. D. Chatterjee and R. N. Olcott. Phys. Rev. 85, 147-8(1952) Jan. 1.

A search has been made for spontaneously emitted neutrons from Sm. The source consisted of samarium oxalate in the form of powder, with a Sm content of 782 g. Spectrochemical analysis revealed that the sample was completely free from Be and B. It contained, however, traces of Mg, Al, and Si, which might contribute to some (α,n) reaction, in addition to traces of Mn, Cu, Bi, Eu, Gd, and Pb. Two experimental arrangements were set up within paraffin cylinders. In the first, one B^{10}-enriched BF_3 counter was surrounded by 12 Sm sticks arranged in a concentric ring. In the second, the positions were reversed, several counters being arranged about the Sm. No evidence about the spontaneous emission of neutrons from Sm could be obtained in either of the experiments. The presence of Sm slightly lowered the average background count of the BF_3 proportional counters. An attempt is made to explain the report of detection of neutrons by Yagoda and Kaplan (Phys. Rev. 76, 702(1949)).

2220

LIFETIME OF AN EXCITED STATE OF $_{66}Dy^{160}$ AND UPPER LIMITS FOR SOME OTHER NUCLEI. F. K. McGowan. Phys. Rev. 85, 142(1952) Jan. 1.

An excited state in $_{66}Dy^{160}$ with a half life of $1.8 \pm 0.2 \times 10^{-9}$ sec has been observed with a delayed-coincidence scintillation spectrometer using sources of Tb^{160}. Upper limits were also established for the half lives of excited states of the following nuclei: Te^{123}, $<1.0 \times 10^{-9}$ sec; Te^{125}, $<2.0 \times 10^{-9}$ sec; Ho^{165}, $<0.8 \times 10^{-9}$ sec; Hg^{198}, $<0.4 \times 10^{-9}$ sec; and Tl^{203}, $<0.4 \times 10^{-9}$ sec.

2221

DISINTEGRATION OF THE GROUND-STATE Sr^{85} AND METASTABLE ENERGY LEVEL OF 514 KEV IN Rb^{85}. W. S. Emmerich and J. D. Kurbatov. Phys. Rev. 85, 149-50(1952) Jan. 1.

The radiations of 65-day Sr^{85} have been investigated in an effort to compare excited states in Rb^{85} observed in disintegration of Sr^{85} and Kr^{85}. Analysis of the radiations emitted by the 65-day period showed that electrons, x rays, and γ rays are present. The electrons were measured by spectrometers and found to consist of internal conversion electrons corresponding to a 514 ± 3-kev γ transition. In the region from 120 to 200 kev, where an energy level of Rb^{85} was reported from the disintegration of Kr^{85}, neither internal conversion nor photoelectrons were observed. For the 514-kev transition, the internal conversion coefficient in the K shell was found to be 0.7%. The K to L ratio is estimated to be 12 ± 3. Disintegration directly to the ground state and to excited states other than the 514-kev level in Rb^{85} does not occur with appreciable intensity. The half life of Rb^{85*} is >1 μsec and the isomeric transition to the ground state $(f_{5/2})$ is M2 or E3.

2222

THE ISOMERIC TRANSITION IN Ge^{77}. Allan C. G. Mitchell and Alan B. Smith. Phys. Rev. 85, 153-4(1952) Jan. 1.

Ge metal was bombarded with cyclotron slow neutrons and was then examined with the help of a scintillation spectrometer by the photographic method of Hofstadter and McIntyre (Phys. Rev. 80, 631(1950)). The decay scheme of Ge^{77} is given as follows: the 59-sec level has the configuration $(p_{1/2})$ and lies 380 kev above the ground state; this isomeric state decays by β^- emission (maximum energy 2.8 Mev) to the ground state of As^{77} $(p_{3/2})$ and by 380 ± 20 kev γ emission to the ground state of Ge^{77}. The ground state of Ge^{77} has the configuration $G_{7/2}$ and decays by β emission (highest-energy β group has maximum energy of 2.2 Mev) to the 0.263-Mev state of As^{77}.

2223

MEASUREMENTS OF SOME K-SHELL INTERNAL CONVERSION COEFFICIENTS. F. K. McGowan. Phys. Rev. 85, 151-2(1952) Jan. 1.

K-shell internal conversion coefficients have been measured with a NaI scintillation spectrometer for the following γ transitions: 85 kev in Dy^{160}, $\alpha^K = 1.65 \pm 0.2$; 95 kev in Ho^{165}, $\alpha^K \lesssim 2.9$; 81 kev in Er^{166}, $\alpha^K = 1.9 \pm 0.3$; 85 kev in Yb^{170}, $\alpha^K = 1.5 \pm 0.2$. Extrapolated K-shell conversion coefficients for E2 radiation are also listed. The transitions of Dy^{160}, Er^{166}, and Yb^{170} are to the ground state; the transitions are of E2 type; and the spin of the excited state is 2.

2224

TRANSITION ENERGY DETERMINATION FOR ORBITAL CAPTURE. P. R. Bell, Josef M. Jauch, and Judith M. Cassidy. Science 115, 12-13(1952) Jan. 4.

A new method is described for studying K-capture transition energies. An element decaying by orbital electron capture to the ground state of the daughter element has x rays of the daughter element as its principal detectable emission. There are, however, undetectable neutrinos and a weak but detectable γ-ray continuum. This spectrum is analogous to the continuous γ ray, generally called "internal bremsstrahlung," accompanying β-ray transitions. The spectrum of the γ rays accompanying the β transitions extends up to the maximum energy of the β rays, and in the K-capture transitions the spectrum extends to the transition energy plus the energy obtained from the K-electron captured by the nucleus. The energy from the K-electron is the rest energy of an electron (0.511 Mev) less the K-orbit binding energy. A sample of Fe^{55} (containing a small amount of Fe^{59}) was measured with a scintillation spectrometer and a pulse spectrum obtained. The lower energy end of the spectrum shows the continuous γ-ray inner bremsstrahlung spectrum. The strong peak at 190 ± 5 kev is the missing crossover γ ray of Fe^{59} not previously reported. A value of $W_0 = 206 \pm 20$ kev for the transition energy including the K-electron energy was obtained. This is in good agreement using Stelson and Preston's value of Q = 1.006 Mev from which the value $W_0 = 217 \pm 10$ kev was obtained.

2225

ON THE MEASUREMENT OF THE ANGULAR CORRELATION BETWEEN TWO GAMMA RAYS OF NICKEL (60).

Sudhansu Das and Sunil Kumar Sen. Indian J. Phys. 25, 451-7(1951) Sept.

The angular correlation between the two cascade γ rays of $Co^{60} \rightarrow Ni^{60}$ transitions has been measured, using G-M counters. The source was in the form of $CoCl_2$ solution. From the correlation function $W(\theta)$ of Hamilton, the curve $N(\theta)/N(\pi/2)$ plotted against θ is explained on the assumption that the two radiations are octopole—octopole in nature. An alternative spin-parity scheme of $Co^{60} \rightarrow Ni^{60}$ transitions is suggested. (auth)

2226

CONCERNING THE EXISTENCE OF POSITIVE PARTICLES EMITTED BY P^{32}, A β EMITTER. Tosiko Yuasa. Compt. rend. 234, 619-21(1952) Feb. 4. (In French)

The existence of positive particles in the vicinity of β^- emitters has been suggested by various authors as a result of cloud-chamber experiments, but confirmation by magnetic β spectrography was lacking. The present author reports a careful study of P^{32} by both these methods. N^+/N^- ratios of 1.6×10^{-3} and 7×10^{-5} to 10^{-4} were found with the cloud chamber and spectrograph, respectively.

2227

THEORETICAL DISCUSSION OF THE BETA DECAY OF ^{32}P. D. L. Pursey. Proc. Phys. Soc. (London) 64A, 1138-9(1951) Dec. 1.

The apparent contradiction between the empirical second-forbidden ft value of P^{32} and its allowed-shape β spectrum is discussed. It has been shown (Phil. Mag. (7) 42, 1193 (1951)) that for single-particle transitions involving an orbital angular momentum change of two units, and a total angular momentum change of one unit the matrix elements $\int \sigma$ and $\int \beta \sigma$ (which are usually classed as allowed) are of order $(v/c)^2$, where ν is of the order of the nucleon velocities. Since according to the shell model the decay of P^{32} is of this type, this may account for the long half life of the transition. However, angular correlation measurements by Sherwin (Phys. Rev. 82, 52(1951)) between the emitted electron and neutrino are not consistent with this scheme. The spectrum shape, lifetime, and angular correlation can all be explained by assuming that the transition is allowed, and that the interaction is mainly tensor or axial vector with an admixture of about 1% of polar vector; this explanation, however, seems very artificial.

2228

SEARCH FOR LONG-LIVED Nb^{94}. R. E. Hein, C. M. Fowler, and R. H. McFarland. Phys. Rev. 85, 138-9(1952) Jan. 1.

A search has been made for radiations from a long-lived isomer of Nb^{94}. A 500-mg sample of Nb metal was irradiated with neutrons for 4 months. Spectrographic analyses of the sample indicated $<0.001\%$ each of Zr, Ti, and Fe, and probably $>0.001\%$ Ta. Thirty conversion groups were observed, all but three of which matched those of Ta^{182}. The three remaining lines are from Hf^{181} decay. A minimum half life of 5×10^4 yr is proposed for Nb^{94}.

2229

THE RADIATIONS OF RaD. R. C. Bannerman and S. C. Curran. Phys. Rev. 85, 134-5(1952) Jan. 1.

The radiations of RaD (PB^{210}) have been investigated by means of two scintillation spectrometers in coincidence. The limiting energy of the β rays is 18 ± 2 kev, and a total transition energy of ~65 kev is indicated. A decay scheme is proposed by which the 18-kev β is followed by a 46.7-kev γ or by lower-energy γ rays in cascade. Gamma rays in coincidence form a rather broad distribtuion extending from ~16 to just over 30 kev, with a maximum in the region of 23 kev. Energy levels are assigned to RaE (Bi^{210}) as follows: 16, 23.2, 37, 42.6, and 46.7 kev. Investigations of the integrated spectrum with a split crystal of NaI(Tl), within which a thin source of Pb^{210} was held, indicated possibly that either the 42.6- or 37-kev level (or possibly both) is probably metastable.

SPECTROSCOPY

2230

THE HYPERFINE STRUCTURE ANOMALY OF THE Rb ISOTOPES. S. A. Ochs and P. Kusch. Phys. Rev. 85, 145 (1952) Jan. 1.

An atomic beam method has been used to measure the hfs splitting $\Delta\nu$ of Rb^{85} as 3035.730 ± 0.005 Mc and of Rb^{87} as 6834.681 ± 0.010 Mc. In comparing these results with the splittings calculated from the nuclear magnetic ratio measured by Yasaitis and Smaller (Phys. Rev. 82, 750 (1951)), a value of $\Delta \equiv \frac{(\Delta\nu^{87}/\Delta\nu^{85})_{obs} - (\Delta\nu^{87}/\Delta\nu^{85})_{calc}}{(\Delta\nu^{87}/\Delta\nu^{85})_{calc}}$ of $0.3501 \pm 0.0006\%$ was obtained. Nuclear models which have been assumed in attempts to explain this anomaly are briefly described, but it is concluded that a more detailed theoretical analysis is needed.

THEORETICAL PHYSICS

2231

EQUIVALENCE OF THE S-MATRIX IN DIFFERENT REPRESENTATIONS. L. M. Yang. Phys. Rev. 84, 1258-9 (1951) Dec. 15.

It is pointed out that the equivalence of the S-matrix in the interaction representation and in the Heisenberg representation can be directly inferred to hold generally from kinematical considerations without the necessity of explicit transformation for each particular set of fields.

2232

PRINCIPLE OF DETAILED BALANCE. F. Coester. Phys. Rev. 84, 1259(1951) Dec. 15.

The principle of detailed balance may be stated as follows: The transition probabilities for a certain process and its inverse are always equal. It is shown that detailed balance becomes a simple consequence of the invariance of the interaction under time reversal if the following definition is adopted: The inverse of a given transition is obtained by reversal of the time.

2233

PERTURBATION THEORY AND CONFIGURATION SPACE METHODS IN FIELD THEORY. S. Schweber. Phys. Rev. 84, 1259-60(1951) Dec. 15.

The configuration space treatment of relativistic field theories is investigated in momentum space, with the aim of treating problems of interacting fields. The method of treatment of bound-state problems consists in retaining only a limited number of particle-wave functions in configuration space, and thus can only be formulated in a configuration space treatment of field theory. Consideration is given to the one-body and two-body problems in scalar or pseudoscalar meson theory. The present approximation method does not correspond to a power-series expansion in $g^2/\hbar c$ and thus may be of value in situations where power-series expansions in the coupling constant are not applicable.

2234

CHARGE-SYMMETRICAL INTERACTION BETWEEN NUCLEONS AND LEPTONS. V. Votruba. Phys. Rev. 85, 141-2(1952) Jan. 1.

The hamiltonian defining the direct interaction between the nucleons and the quantized wave field of leptons is considered. It is shown how its form can be changed by acceptance of the Majorana theory for the neutrino.

2235

A SUGGESTED INTERPRETATION OF THE QUANTUM THEORY IN TERMS OF "HIDDEN" VARIABLES. I. David Bohm. Phys. Rev. 85, 166-79(1952) Jan. 15.

The usual interpretation of the quantum theory involves the assumption that the most complete possible specification of an individual system is in terms of a wave function that determines only probable results of actual measurement processes. The only way of investigating the truth of this assumption is by trying to find some other interpretation of the quantum theory in terms of at present "hidden" variables, which in principle determine the precise behavior of an individual system, but which are in practice averaged over in measurements of the types that can now be carried out. In this paper an interpretation of the quantum theory in terms of just such "hidden" variables is suggested. It is shown that as long as the mathematical theory retains its present general form, this suggested interpretation leads to precisely the same results for all physical processes as does the usual interpretation. Nevertheless, the suggested interpretation provides a broader conceptual framework than the usual interpertation, because it makes possible a precise and continuous description of all processes, even at the quantum level. It is suggested that such generalizations may be needed for an understanding of phenomena associated with distances $\leq 10^{-13}$ cm but may produce changes of negligible importance in the atomic domain. Application of the new interpretation to the following problems is discussed: Schroedinger's equation, the stationary state, the many-body problem, transitions between stationary states, and penetration of a potential barrier.

2236

A SUGGESTED INTERPRETATION OF THE QUANTUM THEORY IN TERMS OF "HIDDEN" VARIABLES. II. David Bohm. Phys. Rev. 85, 180-93(1952) Jan. 15.

The interpretation of the quantum theory suggested in Phys. Rev. 85, 166(1952) is applied to the theory of measurements. In principle, these "hidden" variables determine the precise results of each individual measurement process. In practice, however, the observing apparatus disturbs the observed system in an unpredictable and uncontrollable way, so that the uncertainty principle is obtained as a practical limitation on the possible precision of measurements. This limitation is not, however, inherent in the conceptual structure of the interpretation. Simultaneous measurements of position and momentum having unlimited precision would in principle be possible if the mathematical formulation of the quantum theory needs to be modified at very short distances in certain ways that are consistent with the new interpretation but not with the usual interpretation. A simple explanation is given of the origin of quantum-mechanical correlations of distant objects in the hypothetical experiment of Einstein, Podolsky, and Rosen, which was suggested by these authors as a criticism of the usual interpretation. It is shown that von Neumann's proof that quantum theory is not consistent with hidden variables does not apply to this interpretation. In two appendixes the problem of the electromagnetic field in the new interpretation is treated, and answers are given to objections which have arisen in the attempt to give a precise description for an individual system at the quantum level.

2237

THE FORCE BETWEEN PARTICLES IN A NONLINEAR FIELD THEORY. Nathan Rosen and Herbert B. Rosenstock. Phys. Rev. 85, 257-9(1952) Jan. 15.

It is shown for a general class of scalar nonlinear classical field theories, in which singularities are excluded and particles are represented by small regions in which the field is intense, that the interaction between two particles is described by the Yukawa potential at large distances. (auth)

2238

ON THE SUBTRACTIVE FIELD AND THE RADIUS OF THE ELECTRON. Serge Slansky. Compt. rend. 234, 602-4 (1952) Feb. 4. (In French)

In the case of a particle possessing a magnetic moment, the introduction of the subtractive field in a form analogous to that used for the electrostatic field does not eliminate completely the self-energy divergence if the particle is a point. Under certain hypotheses, a radius may be attributed to the electron of the order of 10^{-11} cm, close to $\hbar/2m_0c$.

2239

VACUUM POLARIZATION AS A SOURCE OF A FIELD CUT-OFF FOR THE ELECTRON. Erich Bagge. Z. Physik 130, 650-5(1951). (In German)

A theory of vacuum polarization is developed from analogy with optically polarizable mediums and is applied to a quantized electron theory for a localized point charge.

2240

WHAT IS THE EXPRESSION ANALOGOUS TO THE POYNTING VECTOR FOR SCALAR AND PSEUDOSCALAR MESON FIELDS? Vladimir Srećko Vrkljan. Compt. rend. 234, 301-3(1952) Jan. 14. (In French)

In equations for meson fields of the scalar, pseudoscalar, and charged pseudoscalar Proca types, the expressions whic are analogous to the Poynting vector in classical electrodynamics are pointed out.

2241

THE SOLUTION OF THE JANOSSY G-EQUATION. H. Messel and G. W. Gardner. Phys. Rev. 84, 1256(1951) Dec. 15.

In Proc. Phys. Soc. (London) 63A, 241(1949) Janossy gave an equation describing the development of a nucleon cascade in homogeneous nuclear matter. The difficulty of solving the equation led Janossy to introduce a generating function, the "G equation." It is shown in the present paper how Janossy's equation can be solved without resorting to the G equation. The methods developed are directly applicable to the similar problem in electron-photon cascade theory.

URANIUM AND URANIUM COMPOUNDS

2242

Institute for Nuclear Studies, Univ. of Chicago
TECHNICAL REPORT NO. 1, by Clyde A. Hutchison, Jr. Spring, 1951. 141p. (NP-3631; Technical Report No. 1; U19846)

Magnetic susceptibility studies: Measurements of magnetic susceptibilities were extended to lower temperatures and to the compounds $U(SO_4)_2 \cdot 4.22H_2O$, $U(C_2O_4)_2 \cdot 6H_2O$, $UF_4 \cdot 3NaF$, and $NaNpO_2(C_2H_3O_2)_3$. The purpose was to determine whether the observed susceptibilities and their variations with temperature can be accounted for in magnetically dilute salts in terms of the perturbations created by the crystalline electric fields. Data were also desired to test the applicability of theory in the low-temperature region where deviations from the Weiss-Curie law become large the rise in susceptibility cannot continue, the latter indicating a nonmagnetic ground state. The measurements covered the temperature range from the triple point of H to about room temperature. At low temperatures, the U^{+4} compounds showed susceptibilities which did not rise toward infinite values at 0°K but approached a constant value. The Np^{+6} compound indicated a high-temperature susceptibility which followed the Weiss-Curie law, having a slope equal to that of the Curie-Law curve for a free ion with unpaired f electrons. At the lowest temperatures the susceptibility continued to rise toward infinite values at 0°K, sinc the number of unpaired electrons was odd and the electric fields could not remove all the degeneracy. Paramagnetic resonance absorption (pra): Data were obtained on the magnetic-energy levels in crystalline substances containing heavy metal ions to aid in determining their electronic distributions. Microwave measurements of the angular dependence of pra were made on powdered and crystal forms of the Tutton salts of $V(NH_4)_2(SO_4)_2 \cdot 6H_2O$ and $Mn(NH_4)_2(SO_4)_2 \cdot 6H_2O$, and salts of di-, tri-, and tetravalent V. Energy levels were calculated and related to the data, and molecular models of the compounds were devised. The experimental microwave absorptions, taken as a function of field strength and angle of rotation for 3 V-salt crystals cut along different axes, were consistent with a model in which the axes of electrical symmetry of an H_2O octahedra make angles of 47.0° with each other. Measurements of the pra of the Mn^{+2} salt indicated a large interaction between the nuclear and electronic magnetic moments, with the probability that the nuclear interactions were of the same magnitude as the crystalline field interactions. Measurements were also made on MnF_2 from room temperature to below the antiferromagnetic transition, on organic compounds with odd electrons, on organic solvents containing free radicals, $U(SO_4)_2 \cdot nH_2O$, $U(C_2O_4)_2 \cdot 5H_2O$, UCl_3, UCl_5, $U(C_5H_7O_2)_4$(acetyl acetonate), and on LiF irradiated with neutrons. (NRS abst.)

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For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

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NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This list in the individual issues of Volume 6 supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 5, No. 24. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA.

Abbreviations used below are:

NSA - NUCLEAR SCIENCE ABSTRACTS
ADD - ABSTRACTS OF DECLASSIFIED DOCUMENTS the predecessor of NSA
NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948
AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)
AECU - To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-871, this code is applied only to reports carrying no other recognized code designation.)

Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability
AECD-2933	NSA 4-6726	J. Am. Chem. Soc. 74, 1020-2(1952)
3066	5-3186	Rev. Sci. Instruments 23, 55(1952)
3113	5-3084	Acta Cryst. 5, 19-21(1952)
3146	5-3894	Acta Cryst. 5, 17-19(1952)
3306	6-1856	NSA
AECU-1127	5-3030	J. Phys. Chem. 56, 225-32(1952)
1242	5-5302	$0.30
1245	5-3174	Rev. Sci. Instruments 23, 34-6(1952)
1275	5-3895	Acta Cryst. 5, 22-6(1952)
1485	5-4311	Proc. Soc. Exptl. Biol. Med. 78, 493-7 (1951)
1513	5-4959	Am. J. Physiol. 167, 808-9(1951)
1585	5-5024	J. Biol. Chem. 194, 131-8(1952)
1586	5-5543	J. Biol. Chem. 194, 69-81(1952)
1612	5-6181	Record Chem. Progress (Kresge-Hooker Sci. Lib.) 12, 163-75(1951)
1665	5-6639	Arch. Biochem. Biophys. 34, 484-5 (1951)
1674	5-7033	Phys. Rev. 84, 1068(1951)
1700	6-79	J. Am. Chem. Soc. 74, 563(1952)
1767	6-895	J. Chem. Phys. 20, 13-17(1952)
1769	6-537	J. Chem. Phys. 20, 6-9(1952)
1770	6-804	J. Chem. Phys. 20, 10-12(1952)
1777	6-760	Proc. Soc. Exptl. Biol. Med. 78, 416-21 (1951)
1778	6-761	Cancer Research 12, 44-9(1952)
1856	6-1676	NSA
1870	6-1591	NSA
1871	6-1697	NSA
1872	6-1592	NSA
AD-279(B)	NSA 5-2653	J. Immunol. 68, 87-95(1952)
ANL-4631	5-4692	Acta Cryst. 5, 17-19(1952)
4632	5-5247	Acta Cryst. 5, 19-21(1952)
ANP-72	6-272	$0.10
BNL-1009	5-7332	J. Chem. Phys. 19, 1609-10(1951)
ISC-125	5-3086	Acta Cryst. 5, 85-93(1952)
159	5-5987	J. Chem. Phys. 20, 18-21(1952)
161	6-1028	$0.15
ML-154	6-1488	Phys. Rev. 85, 374-5(1952)
MLM-495	5-4931	J. Applied Phys. 24, 1504-5(1951)
NP-3163	5-6214	J. Metals (N. Y.) 3, 923-5(1951)
NYO-641	6-1285	$0.10
703	5-6873	J. Am. Chem. Soc. 74, 1101-3(1952)
904	5-5702	Phys. Rev. 85, 295-309(1952)
3004	6-1794	NSA
3005	6-1911	NSA
UCRL-1005	5-2906	Phys. Rev. 85, 249-56(1952)
1428	6-777	Genetics 36, 478-87(1951)
1467	5-6351	Phys. Rev. 85, 204-15(1952)
1486	5-7255	J. Chem. Phys. 20, 199-200(1952)
1487	6-387	Phys. Rev. 84, 1068-9(1951)
1543	6-670	Phys. Rev. 85, 373-4(1952)
1560	6-861	$0.10
UR-186	5-6956	Proc. Soc. Exptl. Biol. Med. 78, 226-9 (1951)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 1, page "SUPPLEMENT 1".

${}_{1}H_{2}^{3}$	Spectral shape analyzed neutrino mass <5 kev	O. Kofoed-Hansen, Phil. Mag. 42, 1448 (1951).
${}_{3}Li_{3}^{6}$	Level $Li^{6}(p,p)$ 2.12 sπ	W. M. Harris, Phys. Rev. 84, 1249(1951).
Be	σ_t(1.9 – 3.8 Mev) graph Broad maximum at 2.75	R. Ricamo, W. Zünti, Helv. Phys. Acta 24, 419(1951).
${}_{4}Be_{4}^{8}$	Li(p,n)54^{d}Be Resonances: 2.2, 4.5	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{4}Be_{4}^{8}$	Level $B^{10}(\gamma,d)Be^{8} \rightarrow 2\alpha$ (broad) ~5.8? ppl	M. J. Brinkworth, E. W. Titterton, Phil. Mag. 42, 952(1951).
${}_{4}Be_{6}^{10}$	p(θ) $Be^{9}(d,p)$ I(0.0 and 3.37 levels) = 0, 1, 2, or 3 (+)	F. A. El-Bedewi, Proc. Phys. Soc. (London) 65A, 64(1952).
${}_{5}B_{4}^{9}$	τ $>3 \times 10^{-19s}$ n spread $Be^{9}(p,n)$	P. H. Stelson, W. M. Preston, Phys. Rev. 83, 469(1951).
${}_{5}B_{6}^{11}$	γ's $B^{10}(d,p)$ 4.5, 6.7, 9.0 pair s	J. Terrell, G. C. Phillips, Phys. Rev. 83, 703(1951).
C	σ_t(1.9 – 3.8 Mev) graph E_0 σ_0 Γ 2.09 2.4 ~0.04 2.95 2.6 ~0.14	R. Ricamo, W. Zünti, Helv. Phys. Acta 24, 419(1951).
${}_{6}C_{6}^{12}$	$B^{11}(p,n)20.4^{m}C$ Resonances: 3.7, 5.2, 5.9, 6.4	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{6}C_{6}^{12}$	γ $B^{11}(d,n)$ 4.5 pair s	J. Terrell, G. C. Phillips, Phys. Rev. 83, 703(1951).
${}_{7}N_{7}^{14}$	$C^{13}(p,n)10.1^{m}N$ Resonances: 4.0, 5.0, 6.2	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{7}N_{7}^{14}$	σ(2 Mev n,p) = 0.07 (3.6 Mev n,p) = 0.15 σ(2 Mev n,α) = 0.01 (3.6 Mev n,α) = 0.02	W. Bollmann, W. Zünti, Helv. Phys. Acta 24, 517(1951).
${}_{7}N_{8}^{15}$	Resonances $N^{14}(n,\alpha)B^{11}$ 2.26, 2.56, 2.75 $N^{14}(n,p)C^{14}$ 2.26, 2.80	W. Bollmann, W. Zünti, Helv. Phys. Acta 24, 517(1951).
${}_{7}N_{8}^{15}$	γ's $N^{14}(d,p)$ 4.4, 5.3, 6.4, pair s 7.4, 8.5	J. Terrell, G. C. Phillips, Phys. Rev. 83, 703(1951).
O	σ_t(1.9 – 3.8 Mev) graph E_0 = 1.9, 3.75 Marked dip at 2.37	R. Ricamo, W. Zünti, Helv. Phys. Acta 24, 419(1951).
${}_{9}F_{10}^{19}$	$O^{18}(p,n)1.87^{h}F$ Resonances: 3.3, 3.8, 4.25, 5.1, 5.6, 6.2, 6.7	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{10}Ne_{9}^{19}$	τ 18.6^{s}	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951). F(p,n).
${}_{10}Ne_{10}^{20}$	$F^{19}(p,n)18^{s}Ne$ Resonances: 4.8, 5.4, 5.8, 6.1, 6.5	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{10}Ne_{10}^{20}$	γ's $F^{19}(d,n)$ 8.1, 9.3, 11.5 pair s	J. Terrell, G. C. Phillips, Phys. Rev. 83, 703(1951).
${}_{12}Mg_{12}^{24}$	$Na^{23}(p,n)11.9^{m}Mg$ Resonances: 5.3, 5.6, 6.0, 6.2, 6.4	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{13}Al_{13}^{26?}$	Mg(p,n)7.3^{s}Al Resonances: 5.5, 5.8, 6.0, 6.3, 6.5	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{14}Si_{14}^{28}$	$Al^{27}(p,n)4.9^{s}Si$ Resonances: 6.2, 6.4	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{18}A_{20}^{38}$	Cl(p,n)34^{d}A Excitation function	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
${}_{20}Ca_{21}^{41}$	τ 1.2×10^{5y} K X-ray pc	F. Brown et al., Phys. Rev. 84, 1243(1951). Ca^{40}(slow n,γ); chem.
${}_{24}Cr_{29}^{53}$	I 3/2 para μ ~(±)0.45	B. Bleaney, K. D. Bowers, Proc. Phys. Soc. (London) 64A, 1135(1951).

${}_{25}\mathrm{Mn}_{28}^{53}$	Level	0.40	Cr^{53}(p,n)	P. H. Stelson, W. M. Preston, Phys. Rev. 83, 469(1951).
${}_{27}\mathrm{Co}_{33}^{60}$ 5.2^{y}	$\gamma\gamma(\theta)$ 1.1γ, 1.3γ	≥octupole		S. Das, S. K. Sen, Indian J. Phys. 25, 451(1951).
${}_{30}\mathrm{Zn}_{35}^{65}$	$\gamma/\beta^{+} = 65$		scin	G. M. Griffiths, Phys. Rev. 83, 852(1951).
${}_{34}\mathrm{Se}_{43}^{77}$	I	½	B	S. P. Davis, F. A. Jenkins, Phys. Rev. 83, 1269(1951).
${}_{34}\mathrm{Se}_{44}^{78}$	I	0	B	S. P. Davis, F. A. Jenkins, Phys. Rev. 83, 1269(1951).
${}_{37}\mathrm{Rb}_{49}^{86}$	$\beta\gamma(\theta)$	$b = +0.13$		D. T. Stevenson, M. Deutsch, Phys. Rev. 83, 1202(1951).
${}_{42}\mathrm{Mo}_{51}^{93}$	$0.24e^{-}, \gamma\ (\theta)$ $\gamma\gamma(\theta)$	$b = +0.33$ $b = +0.20$		D. T. Stevenson, M. Deutsch, Phys. Rev. 83, 1202(1951).
${}_{43}\mathrm{Tc}_{53}^{96}$	Γ(0.8 level) ≤ 0.02 ev τ(0.8 level) $\geq 0.5 \times 10^{-13s}$		scin	F. R. Metzger, Phys. Rev. 83, 842(1951).
${}_{43}\mathrm{Tc}_{56}^{99}$ 5.9^{h}	τ dependent on chemical state			K. T. Bainbridge et al., Phys. Rev. 84, 1260(1951).
${}_{45}\mathrm{Rh}_{58}^{103}$	I μ	½ ~ -0.1	S S	H. Kuhn, G. K. Woodgate, Proc. Phys. Soc. (London) 64A, 1090(1951).
${}_{51}\mathrm{Sb}_{69}^{120}$	$6.0^{d}\mathrm{Sb}^{120}$ assignment questioned			L. Katz, A. G. W. Cameron, Can. J. Phys. 29, 518(1951).
${}_{51}\mathrm{Sb}_{71}^{122}$ 2.8^{d}	γ	0.58	a	L. Katz, A. G. W. Cameron, Can. J. Phys. 29, 518(1951).
${}_{57}\mathrm{La}_{83}^{140}$	β^{-}	~2.3	scin	R. C. Bannerman et al., Phil. Mag. 42, 1097(1951).
	γ_1 <1%	0.093	scin	
	γ_2 3%	0.335		
	γ_3 22%	0.49		
	γ_4 16%	0.82		
	γ_5 56%	1.62		
	γ_6 3%	2.55		
	$\gamma_3\gamma_5$, $\gamma_4\gamma_5$, $\gamma_2\gamma_5$			
${}_{77}\mathrm{Ir}_{115}^{192}$	τ	74.37^{d}		J. Kastner, Can. J. Phys. 29, 480(1951).
${}_{92}\mathrm{U}_{147}^{239}$	β^{-} γ 2.0β and 0.9γ not found	1.22 0.075	sl scin	J. R. Huizenga et al., Phys. Rev. 84, 1264 (1951). U^{238}(pile n); chem.
${}_{93}\mathrm{Np}_{146}^{239}$	No E_{β}	>0.72	sl	J. R. Huizenga et al., Phys. Rev. 84, 1264 (1951).
${}_{95}\mathrm{Am}_{146}^{241}$	τ	475^{y}		B. B. Cunningham, quoted by L. B. Asprey et al., J. Am. Chem. Soc. 73, 5715 (1951).

Q's Between Ground States

$\mathrm{C}^{12}(\gamma,n)\mathrm{C}^{11}$	−18.7	L. Katz, A. G. W. Cameron, Can. J. Phys. 29, 518(1951) and L. Katz et al., Can. J. Research 28A, 113(1950).
$\mathrm{N}^{14}(n,\alpha)\mathrm{B}^{11}$	−0.24	W. Bollmann, W. Zünti, Helv. Phys. Acta 24, 517(1951).
$\mathrm{O}^{16}(d,n)\mathrm{F}^{17}$	−1.51	F. A. El-Bedewi et al., Proc. Phys. Soc. (London) 64A, 757 (1951).
$\mathrm{F}^{19}(p,n)\mathrm{Ne}^{19}$	−4.1	J. P. Blaser et al., Helv. Phys. Acta 24, 465(1951).
$\mathrm{Na}^{23}(p,n)\mathrm{Mg}^{23}$	−4.97	
$\mathrm{Mg}^{25,26}(p,n)\mathrm{Al}^{25,26}$	−5.1	
$\mathrm{Al}^{27}(p,n)\mathrm{Si}^{27}$	−5.9	
$\mathrm{Mn}^{55}(p,n)\mathrm{Fe}^{55}$	−1.01	P. H. Stelson, W. M. Preston, Phys. Rev. 83, 469(1951).
$\mathrm{Ni}^{62}(p,n)\mathrm{Cu}^{62}$	−4.6	J. P. Blaser et al., Helv. Phys. Acta 24, 441(1951).
$\mathrm{Ni}^{64}(p,n)\mathrm{Cu}^{64}$	−2.5	
$\mathrm{Se}^{78}(p,n)\mathrm{Br}^{78}$	−4.4	
$\mathrm{Se}^{80}(p,n)\mathrm{Br}^{80}$	−2.6	
$\mathrm{Sr}^{87}(p,n)\mathrm{Y}^{87}$	−2.5	
$\mathrm{Y}^{89}(p,n)\mathrm{Zr}^{89}$	−3.5	
$\mathrm{Zr}^{92}(p,n)\mathrm{Nb}^{92}$	−2.5	
$\mathrm{Zr}^{96}(p,n)\mathrm{Nb}^{96}$	−2.6	
$\mathrm{Nb}^{93}(p,n)\mathrm{Mo}^{93}$	−3.7	
$\mathrm{Mo}^{94}(p,n)\mathrm{Tc}^{94}$	−5.0	
$\mathrm{Mo}^{95}(p,n)\mathrm{Tc}^{95}$	−3.6	
$\mathrm{Mo}^{96}(p,n)\mathrm{Tc}^{96}$	−3.8	
$\mathrm{Ru}^{100}(p,n)\mathrm{Rh}^{100}$	−4.1	
$\mathrm{Ru}^{101}(p,n)\mathrm{Rh}^{101}$	−2.6	
$\mathrm{Te}^{128}(p,n)\mathrm{I}^{128}$	−3.2	
$\mathrm{Te}^{130}(p,n)\mathrm{I}^{130}$	−3.3	

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AVAILABILITY OF AEC RESEARCH AND DEVELOPMENT REPORTS

The Reports Reference List indicates the declassified and unclassified research reports which are abstracted in this issue of *Nuclear Science Abstracts*.

Many of these reports are or will be published in the scientific and technical journals or in volumes of the National Nuclear Energy Series. Upon publication, the report is listed in the supplements to the Numerical Index of Reports, found in the back of each issue of *Nuclear Science Abstracts*.

Reports not intended for publication are sent to the AEC depository libraries listed below as soon as possible after being abstracted. (Some of this group are also for sale by the Office of Technical Services, Department of Commerce, Washington 25, D. C., which will send price lists upon request.)

HOW TO LOCATE AEC REPORTS

If the AEC report number is known, the searcher should go directly to the cumulative Numerical Index of AEC Reports in *Nuclear Science Abstracts*, Volume 5, No. 24, Dec. 31, 1951, or, for recent reports, to the supplements to this index in each issue beginning with Volume 6, No. 1 (Jan. 15, 1952). The Numerical Index of Reports includes a complete list of AEC reports, by number, giving the related abstract number and (where applicable) the journal reference, the National Nuclear Energy Series citation, or the availability through the Office of Technical Services. (Where no indication of availability is given, the report is or will be found at the depository libraries.)

If the AEC report number is not known, searching is aided by the Subject and Author indexes of *Nuclear Science Abstracts*. The indexes refer to an abstract from which the report number may be noted. Declassified reports numbered through 2023 are indexed in the separate, *Declassified Documents Cumulative Index*, and their abstracts appear in the journal, *Abstracts of Declassified Documents*. (Both index and journal are available at depository libraries and are for sale by the Office of Technical Services.)

More complete information is given in a pamphlet, "Availability of USAEC Research and Development Reports," which may be obtained upon request from the Technical Information Service, U. S. Atomic Energy Commission, P. O. Box 62, Oak Ridge, Tennessee.

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